

RHEUMATOID ARTHRITIS

AND ITS TREATMENT

BY PHYSIOTHERAPY.

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The term "Rheumatoid Arthritis" is used, commonly, in two senses - a narrower sense, based on supposed etiology, and a wider, based on pathology. In its narrower sense it is used as suggested by the Nomenclature Sub-committee of the British Committee on Chronic Rheumatic Diseases appointed by the Royal College of Surgeons. This committee suggests (1) that the term be used for two clinical conditions only:-

- (a) The classical type of Rheumatoid Arthritis of women, usually of the child-bearing age, and
- (b) Rheumatoid Arthritis in children, including Still's Disease.

In its wider sense, the term is used to include most of what the committee includes in its term "Rheumatoid Type" when it divides all Chronic Arthritis into this and an Osteo-arthritic Type. This group corresponds largely with what is called in the American literature - on a basis of pathology - Atrophic Arthritis.

In this examination into the problem of Rheumatoid Arthritis and its treatment by Physiotherapy, the wider interpretation is given to the term, and this for several reasons. Even those who (3, 4) divide "classical" or "primary" Rheumatoid Arthritis from the infective or from the climacteric forms of chronic polyarthrititis admit that it is very frequently impossible to determine which type a particular case belongs to. (van Breemen notes (2) that at a demon-

stration of patients with chronic rheumatic conditions at Prof. Wenckebach's University Clinic in Vienna, the patients having been seen by several authorities on Rheumatism, "it was a frequent occurrence that there were four different opinions on one case, or that the names given to the morbid pictures were sharply divergent").

Classifications and groupings varying so widely, an attempt to narrow the term to apply it to only one or two types of case would make it impossible to follow the very extensive researches into the problem being carried on in America, the European continent, and Britain. Perhaps the most valid reason for taking the wider view, is the basis of our present therapy: in the absence of certainty as to etiology - or cause - our therapy is necessarily based on disturbed physiology or on pathology - effects or results. It seems right, therefore, that classification or nomenclature should not assume, or pretend, to, knowledge still lacking, and thus hinder or divert investigation.

The patients available for investigation at this institution (The Devonshire Royal Hospital for Rheumatism and Allied Diseases, Buxton), form probably the clinically richest in-patient chronic rheumatic group in the British Isles. With 300 beds - 150 each for male and female patients - the annual admissions average just over 4,000 for all cases, and 900 in the Rheumatoid Arthritis group.

For purposes of stating views based on clinical descriptions, results of therapy etc., I have

confined myself entirely to patients examined by me on admission, and under my supervision during their stay in hospital. For opinions based on figures, necessitating the reviewing of larger groups, I have endeavoured to assure uniformity of diagnosis and grouping by using the case-sheets of patients under the supervision of only four out of the ten Honorary Visiting Physicians of the hospital - who are responsible for the diagnostic "labels".

RHEUMATOID ARTHRITIS.

Rheumatoid (or Atrophic) Arthritis has been described by Osgood, writing of the United States of America, as "the most generally prevalent and most inadequately treated controllable chronic disease", and there can be no doubt that the description applies equally well on this side of the Atlantic, in respect of both the prevalence of the disease and the inadequacy of its treatment.

As to its prevalence, Rheumatoid Arthritis forms a considerable portion of the diseases classed as rheumatism (Fig.1) which the British Ministry of Health estimated to be the cause of one-sixth of the industrial invalidism in this country and to cost nearly £5,000,000 in sick benefits annually. (5) These figures, be it remembered, do not take into account the uninsured part of the population.

Inadequacy of treatment applies both to the individual case and to the social aspect of the problem - the availability of centres for the application of those physical measures of treatment which are admitted

universally to be, as yet the Rheumatoid Arthritic's only line of defence against crippling.

Both aspects are evidenced in such a hospital as this by the advanced crippling stage of the disease very many patients have been allowed to reach with little or no attempt at treatment before admittance here, and by the long waiting-lists of applicants for admission from all over the country during the greater part of the year.

Rational therapy of a disease must be based on knowledge of its etiology - in the absence of this, treatment remains empirical. In Rheumatoid Arthritis, no opinion as to its etiology has attained universal acceptance as being "the whole story", but most of the extensive work being done in relation to the disease is directed towards the problem of its etiology, and will without doubt, through the solution of this problem, lead to early and adequate treatment.

ETIOLOGY.

The Ligue Internationale Contre le Rheumatisme has adopted the suggestion of its Secretary, J. van Breemen of Amsterdam, that the causation of Rheumatism should be studied under four main heads:-

The Rheumatic Diathesis or Constitutional Anomaly;

Focal Infections;

Abnormalities of the circulation in the skin;

External Conditions (geographic, climatic, occupational, mental fatigue etc.).

It is generally agreed that a large proportion

of patients suffering from Rheumatoid Arthritis - especially where it occurs without any obvious precipitating cause - are of the asthenic type, slim, with a narrow sub-costal angle, round-shouldered, with a bad posture, dull skin, cold and clammy hands and feet and a tendency to enteroptosis.

The factor of heredity is as marked here as in other forms of Rheumatism. It has been put as high as "about 50%".(6) In a series of 120 patients questioned by me, I found the incidence somewhat lower than this:-

A history of definite rheumatic disease was known to the patient in,

Grandparents and parents	in 30 cases,
Uncles and Aunts	in 2 cases,
Sisters or Brothers	in 4 cases;

i.e. in 36 cases or 30%. (In many, relatives from more than one of the above groups were affected, e.g. a grandparent and a sister, or father and aunt).

Figures based on the unsupported statements of patients about the illnesses of their relatives must obviously be regarded as only approximate, but even allowing for this, and for the tendency for members of the same family to be subjected to the same environmental conditions, there can be little doubt that there is a "heritable" rheumatic diathesis.

In what this inherited constitutional anomaly consists it is impossible as yet to say; to some it is an Endocrine-Sympathetic imbalance with disturbance of skin-physiology and defective Calcium metabolism, while to others the enteroptosis and associated sluggish bowel function seem to be the basic disturbing

factors.(7)

An inherited rheumatic tendency, however, will not of itself produce Rheumatoid Arthritis, it only creates conditions suitable for the operation of other factors; of these, the one that has received the most attention is Focal Sepsis.

FOCAL INFECTION.

It is sometimes suggested that a justifiable classification of Rheumatoid Arthritis is :-

(a) Rheumatoid Arthritis due to known infection, and
(b) Rheumatoid Arthritis not due to known infection, and labelled respectively "Rheumatoid" and "Infective" Arthritis. (1, 9). Ray (19) divides Rheumatoid from "Metastatic" Arthritis, and subdivides the latter into arthritis due to such specific infections as Tuberculosis, Gonorrhoea, Dysentery, Pneumonia, etc., and a group he designates "Indeterminate Metastatic Arthritis". He ascribes this group to a large number of strains of the streptococcus, says that failure to find the organism in the affected joint justifies labelling the case "True Rheumatoid Arthritis" - and then goes on to admit that many competent observers have failed to find the organism in any type of case. Clinically, he differentiates the metastatic from the true forms by several indefinite criteria. Thus, it may arise at any age, it can be associated with any type of physical build, it may attack a large joint first "but no joint in the body can be considered immune". Thus none of the criteria of the "true" form are definitely excluded

from the criteria of the "indeterminate metastatic" form; at most, they are more likely to occur in one form than in the other. This seems to me a very indefinite basis for a classification.

These suggested classifications presume two things, that the finding of a septic focus proves this to be the cause of the arthritis, (and it will be seen later that this is far from being the case), and that failure to find a focus proves its absence. No one who has seen a large number of cases of Rheumatoid Arthritis can have any doubt that, in a large proportion, focal infection plays a precipitating part in patients predisposed to the condition by other factors discussed here, but, in the present state of our knowledge of organisms and of our reactions to them, I find it impossible to accept a separation of "True" from "Infective" or "Metastatic" Rheumatoid Arthritis based on the finding or the failing to find a septic focus in an individual patient.

The fallacy of attempting a classification on such a basis becomes apparent when we examine the complexity of the relationship of Arthritis to focal infection.

It has never been shown that in a given number of patients with arthritis of the Rheumatoid type, more will be found to be harbouring foci of infection than an equal number of patients with other, non-arthritic, diseases.(11)

Even the firmest protagonists of the focal-infection view fail to agree as to how the focus

brings about the joint changes - whether by embolic deposits in the joints, by bacteraemia, or by sensitisation - what organism is responsible, or as to whether the organism, whatever it may be, can or can not be found in or near the affected joints.

Coste and Forrestier (13) in a voluminously documented paper represent the Continental, and particularly the French, view when they express themselves as being "un peu etonne" at the extent to which Anglo-American authors have allowed their attention to be concentrated on foci in Rheumatoid Arthritis. They admit that a large proportion of patients with chronic rheumatism have foci of infection, especially in the mouth and naso-pharynx, but claim that the incidence is much higher in the hospital class than in the leisured class of arthritic, and is equally high in non-arthritic patients.

The complexity of the question is also indicated by Pemberton. (17) In a group of soldiers suffering from arthritis of all forms, 73% had demonstrable foci of infection; of these, 292 cases, the foci were in the tonsils in 52%, in the teeth and gums in 33%, and in the genito-urinary tract in 12%. In a civilian group of 700 cases studied with Pierce, the dental foci were more numerous than the tonsillar. The interesting observation, however, is that in the military group, 46% recovered in the continued presence of demonstrable foci, whereas only 16% recovered after the removal of foci.

Douthwaite mentions (18) that Rheumatoid Arthritis may improve under therapy, not only in res-

pect of the joint condition but also as regards muscle-volume and tone, in the presence of obvious and untreated septic foci.

In my own cases, marked improvement very often resulted from treatment directed to the correction of deformities, improving skin-tone, etc., without any marked improvement in the Blood-Sedimentation rate.

In a series of 3,004 cases of Chronic Arthritis, Steindler (8) found septic foci in 522 or 17%. As many of his cases were out-patients and less-thoroughly investigated than in-patients, he considers that this figure is too low to indicate the actual incidence. The common sites were, in order, tonsils, teeth, sinuses, genito-urinary tract, prostate and uterine adnexa. In 254 cases he had the foci removed and, of these, 90 cases showed favourable effects on the Arthritis.

Miltner and Kulowski reported on 100 cases (25) treated by eradication of septic foci; the results were:-

	Apparent cure	Much improved
37 patients aged 16 or less	73%	16%
63 " " over 16	15%	58%

They conclude that eradication is important in children, and that in older patients the benefit to be expected depends upon the age of the patient and the duration of the disease.

Pemberton, while disclaiming any bias against the large bowel as the potential source of all human ills, claims, as a result of radiological examinations, that the gastro-intestinal tract of chronic arthritics is, in many cases, ptosed, elongated, dilated, angulated and the seat of stasis. He says that this is referable

to disturbance of innervation and to loss of muscular tone in the muscular wall of the bowel; that this condition is commonly associated with the asthenic type of body-build, and that it is favoured by constipation which is more common in women than in men (as is also Rheumatoid Arthritis), and by pregnancy. (10) Lack of Vitamin B is also said to be associated with poor tone in the bowel wall. He draws attention (12) to the rapidity with which glucose and other substances find their way from the bowel to the joint-fluids, and feels justified in concluding that material having a deleterious influence (organisms or their products, or the products of incomplete digestion) may reach the joints from the same source.

Patients admitted to this hospital are supposed to have had all obvious septic foci attended to before admission; nevertheless a considerable percentage of those examined by me had signs of infection in teeth or tonsils, or suffered from constipation.

The organism most often held responsible is the Streptococcus from infection in and about the teeth; infected tonsils provide a mixture of Streptococci (Haemolyticus and Viridans) and Staphylococci, and a frequently overlooked focus in the male, the prostate, often harbours staphylococci.

The work of Hadjopolous and Burbank (14) is of great importance in relation to the place of focal sepsis in the etiology of Rheumatoid Arthritis. (These American authors, incidentally, use the term Rheumatoid Arthritis in the sense in which it is used here). They

produced in rabbits, by the injection of a mannite-fermenting arthrotropic strain of streptococci isolated from the blood of patients with afebrile Rheumatoid Arthritis, arthritic lesions closely resembling those of human Rheumatoid Arthritis. By a special technique (incubating whole excised joints) they demonstrated, uniformly, streptococci in the affected joints. (14) They have recently published a report of their further investigations (15) which lead them to the view that the streptococcus is not a fixed organism, but that Chronic Rheumatoid Arthritis may be caused by a "multiple mutant" infection.

They found, in material from the joints of 21 cases of Chronic Arthritis:-

in the totally inactive form..... negative cultures;
in the slightly active form..... diphtheroid bacilli;
in the moderately active form.... staphylococci, with
or without diphtheroid
bacilli;
in the active form..... streptococci.

Cultures of the non-streptococcal organisms found, when injected into rabbits, produced:-

All the diphtheroids and the majority of the staphylococci in massive doses..... no pathology;

Some staphylococcal forms..... mildly pathogenic, but in no instance with arthrotropic selectivity;

Normal rabbits injected with the diphtheroid organisms became highly susceptible to arthritic lesions from subsequent injections of arthrotropic mannite-fermenting streptococci, (Streptococci Infrequens).

Pemberton too, draws attention (16) to the tendency in modern bacteriology to discard the view that pathogenic organisms bring about their individual

effects by virtue of their specificity or the specificity of their products. He quotes the work of several authors who conclude that organisms bring about their effects through simple chemical substances common to them all, of a nucleo-protein and of a carbohydrate nature. These substances, it is claimed, are not even specific or confined to the bacteria, but are in part at least, widely distributed in Nature.

Whatever view may be taken as to the ultimate mechanism by which it brings about the changes in the joint-tissues - whether it be by actual metastasis of organisms to the joints via the terminal blood-vessels as asserted by Hadjopolous and Burbank (14), by the action of blood-borne toxins poured in the foci, by allergic sensitising action - whether the action, whatever it be, is specific for the organism or not, whether the organism is "fixed" or "mutable" - there can be little doubt that focal sepsis plays an important part in the causation of Rheumatoid Arthritis.

THE SKIN.

A large proportion of patients with Rheumatoid Arthritis show alterations in the physiology of the skin; cold and clammy hands and feet and cyanotic fingers and toes are found in many cases.

Pemberton (20) investigating the reason for an increase in the oxygen-saturation in the peripheral blood of arthritics as compared with that of normal persons, and for the delayed removal of sugar from the blood of arthritics, found by microscopic examination, that in arthritics in general there tends to exist in

the capillaries of the nail-beds, a slow or irregular blood-flow, with a diminution of the amount of blood present in a given microscope-field.

J. Kovacs (21) by capillary and surface-temperature studies of the skin in Rheumatoid Arthritis found that 52.5% had small constricted capillaries, and 65% had slowed blood-flow. He found a decreased number of capillaries in Rheumatoid Arthritis only in skin peripheral to joints with definite swelling.

Hench (21) of the Mayo Clinic denied that the capillary changes are constant in Arthritis, but admitted that in many cases the capillary-flow is slow. He claimed that many patients with Rheumatoid Arthritis have warm, not cold hands and feet. Kovacs, in reply, agreed that impaired capillary circulation was not proved to be an etiological factor in Arthritis, but claimed that in more than half the cases it is present and aggravates the condition.

Bisset and Woodmansey, (22) in a study of nail-bed capillaries by photographic methods, found that rheumatic patients had a paucity of loops and considerable attenuation of the capillaries in all cases, with a consequent tendency to discontinuity in the loops. They concluded that in all well-established rheumatic conditions the capillaries are in a spastic state.

Other observers (23, 24) have found that the skin temperature is lower in arthritics (both Atrophic and Hypertrophic types) than in normal persons, and that on exposure to cold their temperature falls less; also that on cessation of the exposure to cold, the return to the previous temperature is slower.

Pemberton finds this explicable only on a basis of diminution in skin-capillary blood-flow.

There is, as yet, no means of examining the minute-vessel circulation of the joints, but it is suggested that there is a close connection and similarity between this and the skin-circulation, and that the same factors which are responsible for altering the skin circulation act similarly and simultaneously on the joints. (21)

Llewellyn and Jones (26, 27) think that the poor circulation and inadequate thermal-regulation of the skin of the rheumatic diathesis is associated with hypothyroidism. They believe that the storage in the skin of Tyrosine and Cystine is of etiological importance in Arthritis since these amino-acids are the "mother-substances" from which the metabolism-controlling hormones Thyroxine, Epinephrine and Insulin are built up; and that lack of sufficient exposure to the Ultra-Violet end of the spectrum, by preventing the elaboration of these amino-acids in the skin may account for the prevalence of rheumatic diseases in areas where there is a natural or artificially-produced insufficiency of sunlight. Jones (27) therefore suggested giving ultra-violet radiation in the prodromal stages of Rheumatoid Arthritis to mobilise Tyrosine and Cystine in the skin.

The skin of patients with Rheumatoid Arthritis is said to differ from that of normal individuals in its response to stimulation - this is thought to be associated with diminished production of Histamine or the H-substance of Lewis, and has an important bearing

on Physiotherapy. Consideration of this aspect of skin-function will therefore be postponed until the rationale of Physiotherapy is discussed.

The skin plays an important part in the etiology of Rheumatoid Arthritis - so much is evident, but what that part is, is not yet clear. What is becoming clear as the result of increasing interest in the skin and its functions, is that it is not merely a "limiting membrane" between the individual and his surroundings, but an important organ with important functions, and capable through changes in itself of greatly modifying the condition of the complex organism it "contains". Probably, with fuller knowledge, the skin will be found to have a place in the Endocrine- Sympathetic complex, and it will be possible to appoertion the various states of the skin and of its blood-supply and nerve-supply to form part of the syndrome associated with the individual types of some future classification of the Rheumatoid Arthritis group.

EXTERNAL INFLUENCES.

The part played by climate in the etiology of Rheumatoid Arthritis is uncertain; as mentioned above, Jones (27) considers lack of sufficient exposure to the ultra-violet end of the spectrum to be a causative factor in Arthritis. Very little investigation appears to be have been carried out on the etiological aspect of Climatology - most interest seems to have been centered on the influence of climatic changes on established Arthritis, and on the therapeutic values of various

climates. Holbrook, however, (28) found arthritis in Indians living in the States of Montana, Wyoming and Dakota, but none in a tribe of 5,000 living in the Tucson Deserts of Arizona under similar conditions of diet, the only varying factor being the climate. Of 1,000 consecutive cases (whites) seen by him, only one patient hailed from Tucson, and only two cases were found in the practice of 122 doctors practising in that locality.

The wide-spread incidence of Rheumatism in all its forms (and therefore of Rheumatoid Arthritis which forms a considerable proportion of all rheumatic disease) is indicated by the membership of the Ligue Internationale Contre le Rheumatisme. More than 20 countries are represented on this body, including the U.S.A. and such climatically different countries as Norway and Spain, Great Britain and Austria, Italy and Russia.

Study of the effects of occupation as a factor in etiology is apt to be misleading; analysis of large groups almost necessarily means that most of the patients considered are of the "hospital class", an infinitely larger proportion of whom are by the nature of their occupations exposed to extremes of temperature, physical stresses and strains etc., than in the "private" group of patients. It is to be remembered, too, that almost certainly there is a higher percentage of untreated focal sepsis in the hospital class of patients. (13) These considerations must be taken into account in considering the analysis of 2,214 in-patients at Bath

by Coates and Delicati.(29) They divided the patients into four occupational groups, each group being further subdivided - a subdivision of Group C, for example, being "workers liable to exposure to extreme heat".

Group A. Marked exposure to damp, with manual labour, e.g. miners, labourers, hawkers;

Group B. Less exposure, but varying degrees of manual labour, e.g. blacksmiths, plasterers, messengers, ships-stewards;

Group C. Indoor occupations, e.g. shop assistants, factory workers, furnace-men, housewives, and domestic servants;

Group D. Mental workers, e.g. clerks and teachers.

There were 903 males and 1,311 females; among the males the incidence was highest in those exposed to damp and hard work both above and below ground, while those exposed to extreme heat suffered least. Among the females "Home duties" was the most "dangerous" occupation, 1,156 out of 1,311 coming into this sub-group of Group C. This, however, was not specifically characteristic of the Rheumatoid Arthritis cases, but was equally marked in patients with Fibrositis (214 out of 292), Osteo-arthritis (135 out of 168), and Sciatica (35 out of 44).

Kahlmeter (30) from the statistical enquiry made by the Royal Pension Board in Sweden, reports and also expresses surprise at the fact that domestic work is so often associated with chronic articular rheumatism. In Sweden, the incidence in males is higher among labourers and those engaged in the farming and forestry industries than in industrial and transport workers. Their country population (outdoor workers) is much more prone to invalidism from chronic rheumatic

diseases than from tuberculous diseases, while in the towns the reverse is the case.

Anton Fischer of Aachen, in an analysis of 1,114 patients with chronic rheumatism of all types finds (31) that workers in the building industry and those exposed to the influence of damp, heat, and weather-changes are more prone to chronic rheumatism than others to the extent of 15% above the average for all workers.

In a report from Checho-Slovakia (32) 57 male patients were factory workers, 10 agricultural workers; female patients, 46 factory workers and 106 occupied in various domestic duties.

A graph prepared by Dr H. Fortescue Fox from statistics supplied by the registrar of this hospital (Royal Devonshire, Buxton; 1,345 male patients in the 4 years 1928 - 1931) shows that Rheumatoid Arthritis was most prevalent among outdoor workers and underground workers. (33)

From the above it would appear that exposure to cold, damp, extremes of temperature and the vagaries of the weather in the course of employment are an important factor in etiology of Rheumatoid Arthritis. This is probably true, and may be accepted with the reservation that all the available statistics refer to a limited portion of the population only, the "hospital class".

A factor which undoubtedly is of importance in determining the onset of an attack of Rheumatoid Arthritis, is a state of physical and mental strain

sometimes culminating in a mental "shock". A fairly frequent story told by a patient in describing her first attack is "I had been nursing my sick mother for a long time", or "My mother died suddenly, it was a great shock to me, and a few days later my joints began to ache and swell". One male patient dated his arthritis from a week after both his parents had died suddenly within a few days of each other and said further "Just getting away from home, where it happened, to come here, has made a difference to my joints".

THE ENDOCRINE GLANDS.

A much debated question is the relationship of disturbed function of the endocrine glands to the etiology of Rheumatoid Arthritis.

Many observers are of the opinion that the earliest change in Rheumatoid Arthritis is a decalcification of the bone. A similar decalcification occurs in hyper-thyroidism and in hyper-parathyroidism.(34) Estimation of the serum-calcium in Rheumatoid Arthritis has given different results at the hands of different investigators, some finding it higher than normal, some lower, and some unchanged. Leriche of Strasbourg (who, following Oppel, and supported by Weil of Paris, is the chief protagonist of parathyroidectomy for the treatment of Chronic Rheumatoid Arthritis) explains these variations very ingeniously. He says (35) that there may be a temporary hyper-parathyroidism as a response to infection or to "nerve shock", that the freed calcium is not excreted and lost, but undergoes "local transfer to ligaments, muscles, etc. causing the

pain and contractures of an acute attack, that the gland may then recover and settle down to normal functioning, leaving the joints, ligaments, etc. damaged, until another temporary hyper-parathyroid phase is determined by the same cause as before.

Leriche had operated on 6 cases of Chronic Rheumatoid Arthritis; in one case the result was "marvellous" and permanent (after one year), 3 gave similar but less dramatic results, but relapsed on the appearance of an intercurrent infection.

Weill reports (35) the results of parathyroidectomy in 7 cases of Spondylitis Rhizomelique; one was unsuccessful, 3 had temporary or partial improvement, and 3 were practically cured.

Leriche makes no claims on a basis of so small a number of cases; he suggests, however, that in his opinion this line of investigation will prove a fruitful one, especially if treatment of the parathyroid glands is combined with Sympathectomy.

Langdon Brown (70) agrees with Hertoghe whom he cites that in minor degrees of hypothyroidism there is frequently relaxation of articular ligaments causing painful heel, flat-foot, etc., due to deficient katabolism causing infiltration with myxoedematous material, and that similar infiltration of fascia and tendons may cause Rheumatoid pains. He notes the close association between tonsillar sepsis and both Rheumatism and Thyroid disease. He quotes Llewellyn's opinion that the inherited tendency to rheumatism is an inherited tendency to thyroid inadequacy or instability.

Llewellyn and Jones, as mentioned above, (26, 27) associate the circulatory and temperature-regulatory deficiencies of the rheumatoid patient with hypothyroidism. Mouriquand of Lyons, however, points out that rheumatism is far from common in Myxoedema. (36) I have frequently observed, in young girls with Rheumatoid Arthritis, the presence of varying degrees of diffuse swelling of the Thyroid Gland, with marked vaso-motor instability - flushing on palpation, or from the nervousness associated with the examination on admission to hospital - of the skin of the front of the neck and upper part of the chest.

The occurrence of arthritis at the menopause suggests that the ovarian secretions have an effect in causing or in modifying the arthritis. I have recently seen two patients in whom pregnancy had a definite relationship to the onset and course of Rheumatoid Arthritis. In one, the history was briefly, as follows:-

Onset of the first attack was during the puerperium of her first pregnancy; the condition was intermittent for two years, and in the second puerperium there was a severe recurrence. As the result of this, the patient was confined to bed for two years, the knees becoming "locked". She became pregnant again, and in the third month of the pregnancy the arthritic condition began to improve greatly, the knees loosened, and the patient was able to leave her bed and do her housework. A less severe attack supervened after the birth of the third child.

In the other case, the patient said that she had had

acute attacks every winter for three years, had then become pregnant, had no attack that winter, and then when her child was 8 months old had the worst acute attack she had ever had.

The most we are yet able to say about the relationship of the Endocrine Glands to Rheumatoid Arthritis is that, while altered function of these glands have probably no primary or essential etiological significance, (their disturbance may perhaps be the result of the same cause, bacterial or not, which is bringing about the arthritis) they appear to play a part in bringing about conditions in the patient favouring the appearance of arthritis, and the development of chronicity.

Having considered various factors in the etiology of Rheumatoid Arthritis, what can we say about the cause of this disease ?. Not that it is caused by a specific organism under definite conditions, but that it can arise in one form or another in almost anyone, but more especially in females; at almost any age, but more especially at or about the times of changes in the reproductive system - puberty, parturition, or menopause. That an acquired or hereditary rheumatic diathesis predisposes to it, and consists in alteration to the blood supply to the skin and probably to the joints, and a reduced ability of the skin to react to changes of temperature; and in lowered functional activity of the bowel. That in such individuals, the presence of a septic focus, especially if the infecting organism is the Streptococcus, is almost

certainly the precipitating factor, and that in them periods of physical or mental strain or exposure to damp or changes of temperature in the course of their daily work are often the additional "insults" that determine the onset of Rheumatoid Arthritis.

CLINICAL.

Patients who are suffering from the Rheumatoid type of Arthritis can be placed in two groups, with an additional group made up of those with Ankylosing Spondylitis. (Still's Disease - Rheumatoid Arthritis in children, with associated Splenomegaly etc., forms another group, but I have not seen a case in this hospital in the past year). These two groups correspond roughly, with the types designated by some "True Rheumatoid" and "Infective" Arthritis, to which designations I have taken exception in a previous paragraph. There can be no doubt that there are variations in the clinical appearances and their development; I cannot admit, however, that these are so distinct or so constant as to afford a basis for a hard-and-fast classification, least of all for a classification which implies definite knowledge of the etiology of the individual group.

The groups overlap at every point, sex and age incidence, presence or absence of obvious focal sepsis, mode of onset, progress, radiographic appearances etc., and in most cases it is, in my opinion, impossible definitely to place the condition present in one or other group. Only when we keep this in view does it

cease to be scientifically dangerous to attempt to separate one clinical type of Rheumatoid Arthritis from the other.

In the first, numerically smaller, group the great majority are females between puberty and the menopause, of the thin asthenic type, with poor peripheral circulation and Sympathetic imbalance manifested by cold and clammy hands and feet. There is not uncommonly, especially in the younger patients, a "simple" enlargement of the Thyroid Gland, with unstable vasomotor control of the skin of the front of the neck and upper part of the chest. There is not necessarily a history of a definite focal sepsis in, say, teeth or tonsils; the precipitating factor is usually less concrete than this - a period of physical or mental strain or a "mental shock". In a series of 71 female patients (the number including all types of Rheumatoid Arthritis) 3, all falling into this first group had a definite history of first onset during a puerperium and improvement of the subsequent chronic stage during a subsequent pregnancy or pregnancies.

The onset is usually insidious, with a feeling of being "below par" and vague aches in the muscles, bones and joints. It may, however, be acute, with severe pain and swelling in the joints. The acute stage dies down spontaneously after a varying interval, but leaving its mark on the affected joints, and may or may not reappear after months or years.

The progress of the disease is centripetal; starting in the small joints of the hands or feet with pain, stiffness and fusiform swelling, it affects

bilaterally and symmetrically in more or less regular order, the wrists, elbows and shoulders, ankles knees and hips. The acute stage may cease at any stage of the progressive involvement of the joints, and, as mentioned above, flare up after an interval and attack again the already damaged joints and muscles, or continue with its progressive attack on joints not previously affected.

The appearance of the hands in the chronic stage is characteristic; they are moist and cold, joint involvement is bilateral and symmetrical, and there is marked wasting of the Interossei and thenar muscles, with ulnar deviation of the whole hand and weakness of the grip. This weakness is most marked when the wrist has become ankylosed in a position of palmar flexion. The fingers are spindle shaped as a result of swelling of the proximal inter-phalangeal joints; in the early stages the X-rays show this to be due entirely to periarticular changes. In more advanced chronic cases these joints and the distal inter-phalangeal joints may be held in any state of flexion or hyper-extension because of the new stresses set up by the wasting of the small muscles of the hands and the long flexors and extensors. A very common deformity, even when all the other fingers are fairly mobile, is a flexion of the little fingers at both inter-phalangeal joints. The metacarpo-phalangeal joints are not so thickened in this as in the more frankly "infective" type as a rule, but it is in these joints, in this type of arthritis, that I have seen the grossest subluxation deformities

arising within a few months of a first acute attack. In the more chronic stages the ulnar deviation of the hand is sometimes at the metacarpo-phalangeal joints instead of at the wrist.

Ankylosis at the wrist is often present, unfortunately, in a position of flexion of the hand on the forearm. This and the preponderance of flexion over extension deformities generally is usually explained on the grounds that extensor muscles waste more readily than flexors. While this explains the reason for the flexion deformities to some extent it is my opinion that a more important factor is the question of posture. The natural position of any joint at rest in health as well as in disease is one of partial flexion, and a patient in bed is very liable to allow the weight of his hand to flex his wrist (and deviate it ulnarwards at the wrist) unless steps are taken to prevent it. It is surprising how little disability arises from an ankylosed wrist as long as the hand is in the same plane with, or slightly extended on, the forearm - as soon, however, as the hand is allowed to become flexed there is a loss of gripping power altogether incommensurate with the degree of muscle-wasting.

If the elbows are involved there is marked wasting of the muscles of the arms and forearms, and the joints are either ankylosed in a position of semi-flexion and semi-pronation (the position taken up in bed during the acute stage), or, if partly mobile, the limitation of movement is always a limitation of extension with or without limitation of flexion and of pronation and supination. This limitation of extension

at the elbow is, of all joint movements, the most resistant to restoration in these cases.

Movements at the shoulder joints are often very limited, especially abduction of the arm; during the painful stage of the disease the bed-ridden patient may have been compelled by circumstances to make some movements of the fingers, wrists and elbows in feeding and washing herself, etc., - with great benefit to the conservation of some degree of movement in these joints; raising the arm above the head or even above shoulder-level is a manoeuvre seldom required while in bed, and as a result, this joint more than any other not severely involved, becomes stiff. This stiffness is, luckily, almost always due only to fibrous changes in the joint capsule, and the shoulder joints, unlike the elbows, are very amenable to treatment. (That it is dangerous to generalise, however, is indicated by a patient at present under treatment here who, in the course of a "fulminating" acute attack, developed a spontaneous dislocation of the left shoulder which has resisted all treatment though the condition of her knees, which kept her in bed for about a year, has so far improved with treatment that she has started walking-exercises).

If the lower limbs are affected, the muscles show great wasting, partly as part of the general wasting of tissues, and partly from disuse. The feet may be grossly deformed as a result of wasting of the small muscles - the toes being fixed in dorsi-flexion at the metatarso-phalangeal, and plantar-flexion at the proximal inter-phalangeal joints, so that only the heel and the metatarsal heads touch the ground in

attempted walking. With this there is often a valgus deformity of the great toe, or even of all the toes.

There may be ankylosis of the ankle joints, but the commonest cause of crippling is involvement of the knees. If these joints have been affected, the patient is very liable to become bed-ridden if no treatment has been carried out in the acute stage. While in bed in the acute stage the patient has lain with the knees partly flexed in an attempt to find a position causing the minimum of pain and discomfort, and they have either become fixed in this position, or extension at the knees is limited to a greater or lesser extent by fibrous thickening and contracture of the joint capsules. Thus even ^{when} the disease has temporarily or permanently "burnt itself out", walking is either impossible or a difficult and painful shuffle, with flexed knees, and the assistance of sticks or crutches. An unfortunately not uncommon condition of the knees seen in this hospital occurs as the result of misdirected treatment; this is a fixation of the knees in full extension. A surgeon has been called upon to treat knees which are fibrous-ankylosed in partial flexion - he manipulates the joint or joints under general anaesthesia, apparently makes no attempt to, or fails correctly to, assess the potential functional value of the joints, and treating them as he would tuberculous joints, fixes them in full flexion for a lengthy period in plaster.

Recently there was admitted here for treatment a girl aged 15 years whose left knee was thus

manipulated and fixed. A radiograph showed good joint-space and only a degree of thinning of the cartilages, i.e. a potentially servicable joint. Under general anaesthesia, this knee was moved with great ease and 48 hours afterwards the patient was able to bend the leg through 90° of flexion by gently pressing on the left instep with her other foot; with slowly-progressive treatment by massage and movements there is every chance that she will have a serviceable leg in a few weeks.

If it were only more generally realised that the fixation of joints in Rheumatoid Arthritis is primarily fibrous and to some extent determined by the condition of the muscles acting on them, and may not be bony even years after the acute attack, fixation of joints at the hands of surgeons, or by default of treatment at the hands of physicians, would be less common.

The hip-joints are not so frequently involved as the knees, except in association with Spondylitis A Ankylopoetica, and in the younger type of patient. When they are involved, however, treatment is prone to become a long wearying process. From what I have observed, this is not so much because of changes in the joints themselves or in their capsules, as it is related to the fact that the muscles about, and acting on, the hips are the biggest in the body, and muscular spasm is a persistent cause of pain and fear of movements at these joints.

Incidentally, as will appear in the discuss-

ion of treatment, a great deal of the immobility of such joints as the wrists, elbows, knees and hips is due in the acute stage of the disease to muscle spasm, and in the later stages to muscle contractures.

Radiological enthusiasts - S. Gilbert Scott in particular - claim to be able to distinguish one type of Rheumatoid Arthritis from another radiographically. The present type, they say, is distinguished by a generalised loss of calcium from the bones which is absent from the type due to focal sepsis. In the description of one of his plates, however, a radiograph of the hand in a long-standing case of "local infective arthritis" showing generalised decalcification, Scott (37) ascribes this to senility, but admits that "a local infective arthritis starting late in life, is extremely difficult to differentiate, both clinically and radiographically, from Rheumatoid Arthritis".

Before describing the second group I must reiterate, at the risk of labouring the point, that in my opinion, based on some hundreds of cases seen in the past year, it is not possible to draw a definite distinction between the groups, or definitely to classify an individual patient as "True Rheumatoid" or "Infective Arthritis".

In the second group, as in the first described, females are more frequent than males. There is no special type of body-build associated with this group - the patient may be fairly robust, with a wide subcostal angle and have warm and dry hands. In a report previously cited (1) it is stated that this form of

arthritis may occur at any age, but that the majority of cases occur in early in early adult life. In female cases at least, however, I find that if the patient is younger than about 25 years of age, she is more likely to be suffering from the first type described than the present one.

The onset is variable; often there has been a precedent infection, most often in teeth or tonsils, and frequently febrile attacks of a general nature considered at the time to have been Influenza. There may have been a period, of varying length, of premonitory "twinges", or the onset of severe pain and swelling in the joints may have been sudden and unheralded. The latter is the more common course of events if the attack has followed a Tonsillitis or an alleged Influenza.

Any joint or joints may be affected first, and in the early stages bilateral symmetry of involvement is not common. (Later, however, with the spread of the disease process, the left hand, say, may "catch up" with the right, and the distribution appear symmetrical).

There is much less muscle-wasting in this form than in the first. What there is, seems to be the result more of lack of use from fixation of the joints than the result of a direct action on the muscle by the cause of the disease. As a consequence, deformities are less well-marked, on the whole, in this group; ulnar deviation of the hand, for example, is less common. The deformities present are the deformities due

to thickening and fixation of the joints, not so much deformities due to disturbances of the normal stresses on them as a result of muscle wasting.

A feature I have not seen stressed in clinical descriptions, except in Gilbert Scott's atlas (38) is that where the hands are involved, it is the Index and Middle fingers which are most frequently affected; this is especially the case with the metacarpo-phalangeal joints.

Radiographically, the decalcification present in this type is said to be localised to the articular ends of the bones. Reference has already been made to the difficulty of accepting what seems to me to be a matter largely of degree and of time. Then, also, fixation of a joint leads to decalcification of the adjacent bones from disuse, which further complicates the picture, and further reduces its diagnostic value.

The sedimentation rate of the blood is affected in both types. In this hospital the sedimentation rate of the blood corpuscles is measured, not as a rate of fall of the corpuscles, but as a measure of the suspension stability of the serum (referred to as "the S.S."), and is expressed as that percentage of the height of a column of the blood in which the corpuscles have not "sedimented" after the lapse of 1 hour.

The great majority of patients with Rheumatoid Arthritis show a lowered S.S. (i.e. a high sedimentation rate of the blood corpuscles). The larger number of the relatively few cases with a high S.S. fall into the second group described, this being taken to indicate

that the process, whatever it may have been, which has brought about the changes in the patients tissues, and also the changes in the tissues themselves, have ceased to be active. Most of the patients treated here for Rheumatoid Arthritis show little change in the S.S. as a result of their period of treatment, even when there has been marked clinical improvement. The few who have shown a marked S.S. improvement have, in most cases, been patients with Ankylosing Spondylitis.

Ankylosing Spondylitis.

Dr C.W. Buckley, the Senior Honorary Physician at this hospital, after clinical and radiological study of 150 cases, has expressed doubts as to whether Spondylitis Ankylopoetica is a Rheumatoid Arthritis of the spine. (39) His doubt is based on the sex-incidence, 130 males in 150 cases, which is diametrically opposite to the incidence in Rheumatoid Arthritis. It is true, however, that in many cases joints other than the intervertebral ones are affected in a manner indistinguishable from Rheumatoid Arthritis (e.g. shoulders and hips in the type named Spondylitis Rhizomelique). The marked, uniform decalcification of the vertebral bodies in Spondylitis Ankylopoetica is similar to what occurs in other bones in Rheumatoid Arthritis, and the not uncommon history of chronic infection from teeth, tonsils, prostate etc., resembles what is often found in Rheumatoid Arthritis.

The patients are almost all males in early adult life - 15 patients with this disease whom I have

seen here averaged 29 years, the youngest being 18 at the onset and the oldest 43.

The onset is usually gradual, commencing with a long period of vague pains in the back or in the hips or neck. As distinct from the two types of Rheumatoid Arthritis, already described, where the spread of involvement was centripetal and "haphazard" respectively, the spread in Ankylosing Spondylitis is centrifugal starting in the sacro-iliac joints and spine, and, if the other joints are to be affected, spreading thence to the "root joints" and then to the smaller ones.

The vertebral column becomes progressively stiffer as the arthritis of the intervertebral joints progresses. Softening of the vertebral bodies through decalcification leads to kyphotic deformity in the upper-dorsal region of the spine and to alteration in the curvatures of the cervical region. In the lumbar region flattening is the characteristic change. The costo-vertebral joints are also affected by the arthritic changes so that respiratory movements of the thorax become very limited - $\frac{3}{4}$ or even $\frac{1}{2}$ an inch of chest expansion is a common finding on admission to hospital.

Radiographically, the findings are characteristic. The sacro-iliac joints are almost invariably affected first, their outline is lost and ankylosis occurs fairly soon; the vertebral bodies are decalcified. Calcification takes place in the intervertebral joint capsules, and this shows up in a radiogram as two parallel lines of greater density running through the rarified bodies down the length of the affected

portions of the spine. A third opaque line running down between and parallel to the two other lines is the shadow of calcified inter-osseous ligaments, not Buckley states (40) an ossified anterior common ligament. Calcification in the ligamentous fibres from the intervertebral discs which "anchor" the adjacent vertebral bodies shows on the radiogram as bridges linking these bodies.

Whether the three groups of patients here described are sufferers from three entirely different diseases with a number of points of superficial resemblance, or whether on the contrary they are all suffering from one disease with a number of points of superficial difference there are three things they have in common. These are, uncertainty as to the etiology of the condition they are suffering from, absence of specific therapy, and dependence on physical therapy as their only hope of leading reasonably normal lives.

PATHOLOGY.

The earliest changes in the joints in Rheumatoid Arthritis are those which occur in the synovial membrane, and perhaps a synchronous decalcification of the epiphyseal ends of the bones forming the joints. There is a proliferation of the synovial membrane in the form of villi or fringes. From the synovial membrane, at its junction with the articular cartilage, a vascular sheet of granulation tissue, the "pannus" grows out over the cartilage which it erodes, and eventually may destroy by cutting off its supply of nutrition from the synovial fluid.

in the vascular villous proliferations of the synovial membrane there are numerous localisations of small round cells, and an increase in the connective-tissue cells. Eventually, the new blood-vessels in the proliferative tissue are obliterated by endarteritis obliterans, and the villi become fibrous. Adhesions are thus formed between the synovial membrane, pannus and articular cartillages. Meanwhile the articular cartillages are being attacked from the epiphiseal side also. There is proliferation of the connective-tissue cells of the marrow - vascular processes, carrying with them osteoclast cells, attack the cartilage and eventually join up with the pannus which has eroded the cartilage from its articular surface. This invasion from the articular side is not uniform over the whole surface of the cartilage, so that islands of cartilage may be present surrounded by areas of new connective tissue.

in the proliferations arising from the marrow of the epiphiseal ends of the bones also there are aggregations of small round cells. In a recent paper (41) Ernst Freund has described a necrotic process occurring there, and followed by either healing or by invasion of the cartilage on its epiphiseal side by the necrotic process, and proliferation of the connective-tissue cells of the bone marrow. Freund describes occasional giant-cells in these areas and draws a parallel with these findings and what occurs in Gumma and Tuberculosis of bone. He says, however, that his findings do not permit him to form any opinion as to the relationship between Chronic Arthritis,

Syphilis and Tuberculosis.

As in the synovial membrane, proliferative changes take place in the connective-tissue cells of the joint capsule. This becomes thickened, and eventually very dense, fibrous tissue which contracts and limits the movements of the joints. In a radiogram of the "spindled" fingers of a hand of a patient with Rheumatoid Arthritis, the spindling is seen to be due to thickening and distension of the capsule - changes in the articular parts of the joint may first become marked only long after the changes in the capsule and synovial membrane have crippled the joint.

It is many months or even years before the fibrous ankylosis of the affected joints becomes bony, and this will occur only if the joint is allowed to remain fixed. Osteoblastic outgrowth from the epiphyseal ends of the bones converts into bone the fibrous tissue which has obliterated the joint cavity after destroying the cartilage.

The part played by the proliferation of the synovium, the pannus, and the fibrous changes in the capsule have the greatest possible bearing on treatment, and it is of primary importance to realise for a very long time the immobility in a Rheumatoid joint is due to fibrous and not to bony ankylosis.

This will be referred to later in discussing treatment in the acute stage of the disease, and treatment of ankylosed joints in the chronic stage, by manipulation.

DIAGNOSIS

in a group of 104 patients admitted here under their doctors' diagnosis of Rheumatoid Arthritis, the following was the eventual diagnosis arrived at:-

Rheumatoid Arthritis	60
Fibrositis	19
Osteo-Arthritis (Hip and Knee)	8
Sub-acute Rheumatism	6
Gout	5
Synovitis of the knee	2
Subacromial Bursitis	1
Tuberculosis of the Elbow	1
Acute Rheumatism	1

89 patients eventually diagnosed as suffering from Rheumatoid Arthritis were admitted on their doctors' diagnosis of:-

Rheumatoid Arthritis	60
Rheumatism or	
Chronic Rheumatism	15
Chronic Arthritis	6
Osteo-Arthritis	5
Sub-acute Rheumatism	2
Sciatica and Lumbago	1
(The last-mentioned patient was a young professional footballer with early but definite Spondylitis Ankylopoetica).	

From this it would appear that the general practitioner is prone to "over-diagnose" Rheumatoid Arthritis, rather than to fail to diagnose it, at least in the chronic stage.

In the acute stage, the condition Rheumatoid Arthritis has mainly to be differentiated from is Acute Articular Rheumatism or Rheumatic Fever.

In Acute Articular Rheumatism the pain in the joints is more acute, the swelling more rapid, the joints tenser, and the skin over them more inflamed, and the condition "flits" from joint to joint, rather than "progresses" as in Rheumatoid Arthritis. The joints affected first are seldom the smaller ones of

the hands and feet, and they are more spontaneously painful, and tender to the touch than in Rheumatoid Arthritis. There is a general profuse perspiration with a characteristic sour smell - in Rheumatoid Arthritis the tendency is for the excessive sweat-gland activity to be localised to the hands and feet. A favourable response to medication with Salicylates helps to identify Rheumatic Fever, as does also the occurrence of Pericarditis, Myocarditis or Endocarditis.

With the passing of the acute stage, diagnosis becomes easier; Acute Rheumatism subsides leaving the joints not affected in any obvious way. Rheumatoid Arthritis, on the other hand, leaves many signs of its occurrence after the acute stage has died down, thickening or spindling of the affected joints, muscle-wasting, deformity, etc.

When seen in the chronic stage, Rheumatoid Arthritis has to be differentiated from Osteo-Arthritis and from Gout. (Gout, incidentally, I have found to be not quite so "obsolete" a disease as it is generally considered to be: in 600 consecutive admissions - 300 male and 300 female - I have found 14 cases of gout - 11 males and 3 females - all confirmed by estimation of the Blood Uric-acid.).

Osteo-Arthritis is differentiated from Rheumatoid Arthritis by several criteria; it is invariably a condition of middle or advanced age - the joints affected most frequently are the hips and knees - if fingers are affected, it is the terminal rather than the proximal inter-phalangeal joints which are thickened, and these are not spindled but "nodular" (Heberden's Nodes).

Limitations of movements in the affected joints are not due to stiffness and elastic pull of contracted fibrous tissue in the joint or capsule and of muscles, but is inelastic and bony and due to "locking" of osteophytic overgrowths in the joint. In a particular joint, one movement may be free while others are very limited; this is most marked in the hip-joint where flexion of the thigh may be fairly free (the movement of walking having created an eburnated groove in the acetabulum for the head of the femur) while abduction and rotation are practically absent.

The radiogram of an osteo-arthritic joint shows loss or absence of cartilage and osteophytic outgrowths, but no ankylosis.

The S.S. of a patient with Osteo-Arthritis is not lowered.

In the diagnosis of Spondylitis Ankylopoetica the radiogram is of great value, and the findings have been described above. The Osteo-arthritic form of Spondylitis is occasionally, in a comparatively young patient (say in the early 40's) distinguishable from the Ankylopoetic form only by the radiogram. This, in Spondylitis Osteoarthritica shows osteophytic outgrowths from the edges of the vertebral bodies; these outgrowths tend to grow in a hook-shape, and eventually neighbouring ones coalesce. There is no calcification of the intervertebral joint-capsules, and the exostoses described in no way resemble radiographically the calcification of the edges of the intervertebral discs and of the ligaments described in an earlier paragraph.

THERAPY.

All disease, other than congenital disease caused by structural deficiencies or aberrations, is the resultant of the interaction between the individual and his surroundings. Especially since "germs" or "bacteria" were discovered, the tendency in medical science has been to overstress the importance of more or less accidental factors outside the individual as a cause of the disease, and to undervalue or wholly ignore the possibly more important factor of the individual himself.

In Rheumatoid Arthritis, however, perhaps more than in any other disease, the importance of the individual and his reactions to his surroundings has been recognised, and almost as much investigation has been and is being carried out towards the solution of the problem as to why certain conditions will produce Rheumatoid Arthritis in one individual and not in another, as towards discovering what those conditions are.

The future of the therapy of Rheumatoid Arthritis lies in the solution of this problem. It does not lie in the discovery of which particular strain of the Streptococcus "causes" it, but in the hands of those who will prove, not that this or other coccus is or is not found in the joints of the patient, but why in a number of individuals whose throats will produce cultures of Staphylococci and Streptococci of various strains, or both, some will develop Acute Rheumatism, some Sub-acute Rheumatism, some Rheumatoid

Arthritis, some only a sore throat, and some continue apparently unaffected in any way. To talk of "inherited" or of "acquired" immunity is to state the problem not to solve it, and has always impressed me as being on a par with the explanation offered for improvement in the condition of a patient suffering from a chronic disease, that it is due to a "natural remission". When a patient has "acquired immunity" or is undergoing a "natural remission" of his disease it means in effect that for the time being or forever he is master of his surroundings, and the object of therapy should be to make him and to keep him so.

There are two ways of doing this, one is by discovering and strengthening the factors in the individual which enable him to resist his surroundings, and the other is to discover and weaken the factors in the surroundings which overcome his resistance.

Both means are of value in the treatment of Rheumatoid Arthritis, but from the nature of the disease there can never be a "cure" of Rheumatoid Arthritis; there can only be limitation of its effects, and eventually and ideally, prevention of its onset. When a patient has Rheumatoid Arthritis, even in the early acute stage, we are faced with a "fait accompli"; changes are taking place, and will continue to take place after the active stage of the disease is over. There is no "restitutio ad integrum" - it is the natural healing processes themselves which deform the patient's limbs and cripple him.

Treatment then must be devised to do two things; firstly to alter the patient himself or his

surroundings in such a way as to tilt the balance in favour of his resistance so that the present or recent acute attack is cut short and ceases to be progressive, and no subsequent attacks occur; and secondly to prevent or to correct if possible the established fixations of joints and deformities of limbs which result from the pathological changes in his tissues.

The first object has been attempted in many ways. The most obvious was to remove foci of infection where these were found. What the results have been we have seen; if done in sufficiently young patients or sufficiently early in the disease, a proportion show favourable results. Septic foci should, of course be eradicated in every case on general principles, but it is very necessary to realise that in doing this we are not treating the disease, we are only attempting in one respect to adjust the natural balance between the patient and his surroundings.

In dealing with possible foci of infection, the obvious ones are the tonsils, teeth, nasal sinuses and prostate, but the intestinal tract should not be forgotten. The treatment of existing constipation by dietetic or other measures is the obvious method of dealing with an intestinal "focus". Local treatment of the colon by means of lavage is seldom carried out here, and then never more than twice in any patient. Dietetic measures should be directed towards reducing the amount of putrefactive food, and to the supply of and adequate amount of vitamin B, lack of which is said to reduce the intestinal tone and render it more permeable to organisms and their toxins.

Various means have been used in an attempt to raise the patient's resistance to a suspected infection. Non-specific protein-shock by the injection of preparations of sterilized milk (e.g. Pyrolactine) or of bee-venom have been used, and claims as to their efficacy made by enthusiasts. I have seen bee-venom used in a large number of cases here, and sterilized milk in one preparation or another in a few, and have not seen any results which would impel me to use them with any great hope of benefit to the patients.

This, too, applies to vaccine therapy. Either stock streptococcal, or autogenous vaccines from cultures from the teeth or tonsils of the patient are used. There is great divergence of opinion among vaccine enthusiasts as to dosage. Willcox says it is an abuse of vaccino-therapy to use vaccine where there are obvious foci of infection, as they can in these cases do more harm than good and may bring about severe reactions.

Gold-therapy has been extensively used, especially in France where Forestier is enthusiastic about its value in cases of frankly infective origin. Even enthusiasts, however, admit that it is "not without danger, and should be handled with great circumspection". (42) The gentlemen quoted are certainly enthusiasts; they claim that "it can be said that the prognosis of this redoubtable affection has been transformed by this therapeutic measure." Apart from the question as to whether the results are as good as claimed it is my opinion, very questionable whether the use is justifiable of a substance

as capable of bringing about toxic effects as gold is. Rathery and Lacapere who have been quoted above (42) admit that gold is potentially dangerous, that it is impossible to predict whether it is going to be dangerous or not in any individual patient, and that although not fatal these effects are dangerous by virtue of their resistance to treatment. The results of "gold-poisoning" range from the appearance of punctate basophilia to a desquamating dermatitis and even to nephritis, and I have grave doubts as to the justification of submitting patients to risks such as these to attain effects which are I am certain, no better than those which can be attained by very much less dangerous means.

None of the therapeutic measures mentioned can be said to be of definite value in the treatment of Rheumatoid Arthritis. From the nature of the disease it seems to me that it is not along the lines of searching for a "specific" that solution of the problem will come.

In the meantime it is physical therapeutic measures alone which are, with any degree of consistency, of value in the treatment of Rheumatoid Arthritis. This is universally admitted - every writer on the subject says in effect or in so many words "No treatment of Rheumatoid Arthritis can be considered adequate which does not make full use of Physiotherapy".

At present with our incomplete knowledge in the changes of the patient which determine the onset of the disease, the most striking effects of physical methods of treatment are in the prevention or correction

of the results of established disease. But even now we are beginning to understand the part played by capillary circulation, reaction to changes of temperature etc., and the value of Physiotherapy in correcting anomalies in these functions, and it is, I think, not too much to hope that eventually fuller knowledge will enable us to use these methods for the attainment of the medical ideal - prevention rather than attempted cure.

PROGNOSIS.

Left untreated, or inadequately treated, Rheumatoid Arthritis is a progressive disease, not only in that over a period of years repeated acute attacks are likely to occur, each one affecting others of the patient's joints, but also in that the individual affected joints and the muscles associated with them become progressively more seriously disorganised in structure and function after the acute stage has subsided.

It is the progress of such inadequately treated cases that has determined the all too prevalent outlook of hopelessness held by the majority of practitioners in the presence of a patient with Rheumatoid Arthritis.

The reason for inadequacy or absence of treatment is not that the practitioner who is in attendance on the patient does not know how to carry out effectively measures which will prevent deformity and crippling - it is not of great importance that he should know this. What is of the greatest possible

importance is that he should know that there are such measures, and that there should be available clinics and hospitals where he can have them carried out by specially trained staffs under the supervision of specially experienced medical officers.

The prognosis in the vast majority of cases of Rheumatoid Arthritis is good with good treatment, and the earlier the treatment is instituted the better the prognosis. This should not be taken to imply a claim of "cure". In this hospital no patient with Rheumatoid Arthritis is ever labelled "cured" on his discharge sheet. The good prognosis consists in prevention of deformity and crippling, or the restitution to joints and muscles of ability to function. As has been said in a previous paragraph it is usually a matter not of months but of years before an affected joint is fixed by bony ankylosis, and very often joints which are apparently immobile can at least have part of their function restored by treatment.

Ideally, the object of treatment however should not be only the prevention or correction of the effects of the disease - it should also prevent the recurrence of the acute attacks, and "cure" the patient, not of the effects of past attacks, but of the disease itself or the tendency to develop it. To assess accurately the value of any form of treatment from this point of view is at present impossible. The disease, separating it for the moment from its outward manifestations in the quiescent stage, is one which tends to recur at intervals over a period of many years, both the period and the intervals varying widely

in different patients. To measure the value of treatment in curing the disease - whether the treatment consist in altering the patients surroundings or in altering his reactions to them - it would be necessary to have data concerning the histories over a very long period of years, of large numbers of untreated and of treated patients for comparison. These data are not at present available - all we can judge by are the effects of treatment on the individual patient. With the provision of a sufficient number of clinics and hospitals to carry out adequate treatment, there would soon become available a large volume of information on the effects of treatment on those factors in the patient considered to predispose to Rheumatoid Arthritis - the condition of his skin capillary-circulation, his reaction to changes of temperature, his intestinal activity etc., and eventually, on the value of treatment in so changing the patient towards normality as to tilt the balance between him and his surroundings in his favour, and so "cure" him.

I have said that in the vast majority of cases, the prognosis of adequately treated Rheumatoid Arthritis is good - there remains a small minority, but a much smaller one than is generally thought, in which the prognosis is not good. Usually these patients are girls, younger than about 25 years of age, of the thin asthenic type, in whom the disease has arisen without obvious cause, and in whom no focus of infection can be found. Occasionally a patient of this type will fail to respond well to treatment, but far from

giving up treatment in despair on that account, it is in these patients that treatment should be persisted in even for years. In these patients, some unknown factor, either in her "diathesis" or in an undiscovered focus of infection, is tilting the balance against the patient, and to give up any measures which will throw weight, however small, on the right side is a counsel of despair dooming the patient to crippledom. Even in these recalcitrant cases the last state of the treated is better than that of the untreated patient, and at any unpredictable time the active process may stop. If this occurs it has surely been worth while if treatment has left the patient with some moveable joints rather than none, and with immovable limbs in such positions as will allow the maximum of function possible.

SOCIAL AND ECONOMIC.

The controller of Health and Pensions Insurance, Ministry of Health, in 1928, calculated (44) that $5\frac{1}{2}$ million weeks work per annum (representing £12,000,000 in wages), and £5,000,000 disbursed in sick benefit represented the loss to the country due to Rheumatism in insured persons. Of this, 54% in men and 53% in women was Chronic Rheumatic Disease, and of this, according to Glover (45) $12\frac{1}{2}\%$ in males, 50% in females, or $28\frac{1}{2}\%$ in all is due to Rheumatoid Arthritis.

In other European countries the social and economic burden of chronic rheumatic diseases is equally important; Forestier in November 1930 gave the following summary:-

In Sweden 9.1% (the highest figure for any

one group of diseases) of all cases of pensionable invalidism was due to rheumatism - Tuberculosis accounting for 5.8%;

In Germany, among the working population rheumatism of joints and muscles was 8.2 times as frequent as all forms of tuberculosis, and accounted for 3.4 times as many days of illness and 1.4 times as much invalidism;

In Belgium Prof. Gunzburg of the Anti-Rheumatic Centre at Brussels ascribes to Rheumatism an economic importance equal to that of Tuberculosis and Cancer combined;

In France no definite statistics are available, but the chief medical officier of Alsace-Lorraine Railways estimates that one-fifth of the working time lost through illness among the employees is due to Rheumatism.

In Denmark Jansen reports (47) that 14% of all persons drawing invalidity pension were sufferers from chronic Rheumatism.

Danischewski (49) reports that 2.9% in men, and 4.5% in women of all invalidism in the U.S.S.R. is due to chronic Rheumatism and Arthritis - not counting invalidism due to rheumatic heart conditions. He calculates that rheumatic invalidism causes a loss of 38,830 work-years per annum in the U.S.S.R.

Similar figures are furnished by every country where statistics are available; they represent only a part of the cost as they take account only of the industrially insured section of the community.

The cost, however, of Rheumatoid Arthritis to the community is only one side of the problem, there are two other social aspects. These are, the effect of our social and economic organisation in causing or favouring the occurrence of the disease and the measures which should be taken by public authorities to prevent this and to treat the condition where and when it arises.

The importance of working conditions has been considered - and this should be looked at from a wider angle so as to include all living conditions, working, housing, recreation etc., especially in view of the incidence of Rheumatoid Arthritis among housewives. With a fuller knowledge of the importance of diathesis, and recognition of the factors in diathesis which predispose to rheumatic diseases, will it not be possible to reduce the incidence of these diseases by a selective distribution of workers entering industries the conditions in which are known to predispose to them. It is done already with a large proportion of workers; before admission to any branch of Government service a candidate must submit to medical examination - nobody with flat feet or a hernia can become a postman or a policeman. Many large private organisations insist, too, on a medical examination before employing a worker; there is even a tendency to apply psychological tests to ascertain whether a prospective employee is suited for a suggested occupation, and surely it is at least as desirable to ascertain whether a worker is liable by his "make up" to be totally incapacitated by the conditions of his work.



There may be some etiological factors which we cannot alter on social organisation principles, climate, endocrine imbalance, etc., but as Buckley says in a paper on Rheumatism in Industry (48), "We cannot alter our climate, and probably should not be any better off if we did, but we can train the people in habits conducive to higher resistance and better health, and thus while we wait for sound evidence and statistics as to the influence of industries we may find the problem has almost disappeared".

Danischewski in a report (50) of the Committee of the Russian section of the Ligue Internationale Contre le Rheumatisme, gives as one of the objects of his committee "the wider popularisation of the campaign against rheumatism, as a social task - first of all among doctors, who with us as also in other countries, are still insufficiently orientated on the question of Rheumatism, and seldom make early diagnosis or employ early rational treatment".

There can be no doubt that neither the public nor the profession outside the circle of those specially engaged in dealing with rheumatic diseases realises the inroads made by them into the health and the working efficiency of the country, or that education as suggested by Danischewski is urgently required.

In Britain the organised provision made for dealing with rheumatic diseases is lamentably insufficient - the one big step taken in recent years has been the establishment of the British Red Cross Clinic for Rheumatism in London. This hospital (Royal

Devonshire, Buxton) with 300 beds forms with similar much smaller Spa hospitals at Bath and Harrogate the total available specialised accomodation where working class patients with chronic rheumatic diseases can receive spa treatment. They are admitted here free on a subscribers recommendation and in addition make a small weekly contribution to the hospital funds if they are able to do so.

In Sweden, following an investigation carried out by Kahlmeter (51) into the cost of Rheumatic invalidism, the Assurance General des Pensions built onto each of seven general hospitals in different parts of the country a block with 50 - 60 beds specially for the treatment of rheumatic diseases. Kahlmeter considered that the number should be at least doubled and notes that 5 more are being considered. He mentions that as soon as the economic situation permits, the city of Stockholm intends building a hospital with 1,300 beds of which 65 will be allocated to patients with rheumatic diseases.

Copeman has worked out a scheme (52) for the control of industrial rheumatism which has a great deal to recommend it. The patient is seen by his insurance practitioner, who, having diagnosed some form of rheumatic disease sends him to a Rheumatic Advisory Centre which is established in all thickly populated and industrial towns. From this centre the patient, if physical treatment is required, is referred to a Central Treatment Clinic for treatment. If treatment in bed or treatment lasting longer than two months is considered necessary, the patient is sent from the

Central Treatment Clinic to the nearest , or most suitable of the Spa Hospitals established for the purpose. From here, or from the Treatment Clinic the patient should be sent to a convalescent home or holiday resort for at least a week before being referred back to his own doctor as a preliminary to resuming work.

Recently, this hospital and the municipal bathing establishments in Buxton were visited by a deputation from the Public Health Committee of the City Council of Aberdeen who had been investigating the organisation of treatment for rheumatic diseases. Following this investigation, a clinic is to be established in Aberdeen under the guidance of the Professor of Medicine of the University, and in association with a ward at the Royal Infirmary.

In London there is a movement afoot encouraged by several of the leaders of the medical profession to form local-area committees through out the country for the purpose of educating the medical profession and the lay public as to the necessity for instituting an organised campaign against rheumatic diseases.

There is no doubt in my mind that if treatment and investigation were organised on a national basis, or with national encouragement and support in this and in every other country where rheumatic diseases are sufficiently prevalent to form an economic problem, not only would it be of economic advantage to those countries, but in a few years Rheumatism - and especially Chronic Rheumatic Diseases - would cease to have an incidence of any real social importance.

PHYSICAL THERAPY

"Some swear by light and heat, others would be saved by water; some swear by massage and manipulation, others by rest, and some, rightly enough, do not swear at all, but proceed from case to case with tentative empiricism"

(Sir George Newman, Presidential Address, Conference on Rheumatic Diseases, Bath, May 1928)

In man, to rub a painful part of the body has become almost a conditioned reflex based on experience of its efficacy in relieving pain, the application of heat to relieve pain is also universal. The larger part of Physiotherapy is based on these two procedures which have been employed empirically for thousands of years - their persistence bearing witness to their efficacy.

In ancient Greece and Rome baths and massage were extensively employed in personal hygiene and for the treatment of disease, and many of the best-known Spas have direct continuity with Roman balnea, established by the Roman legions and colonisers throughout Europe, and in Britain.

In modern times, Physiotherapy is becoming less empirical, procedures based on principles other than the application of heat and massage have been added, but these two still form the most universally applicable and available form of physical treatment.

Physical methods of therapy are employed in Rheumatoid Arthritis to bring about two groups of

effects - general effects on the patient as a whole, and local effects on particular joints and muscles.

The work of Lewis (53) suggests that the effects of Physiotherapy are produced, not by virtue of the specific form of therapy employed, but through the action of a Histamine-like substance (H-substance) liberated locally at the site of stimulation, by the epithelial cells of the skin as the result of any stimulus.

The sequence of events produced locally by this H-substance is, local vaso-dilatation, local exudation, and a "flare" due to a nerve-reflex action. This is the "triple response of Lewis"; Deutsch (54) states that a fourth phenomenon is produced - hyperaemia of the muscle underlying the skin stimulated, brought about by the action of a further reflex. This, if true, is important for the understanding of the effects of Physiotherapy on the wasted muscles in Rheumatoid Arthritis.

Bisset and Woodmansey (55) found the triple response to be delayed or lacking in the skin of the majority of sufferers from Rheumatoid Arthritis, and therefore concluded that some normally present vaso-dilator was absent. They also measured the time taken for the appearance of flare and a wheal after pricking in a drop of a 1:2,000 solution of Histamine (as suggested by Lewis) into the skin of healthy persons and of patients with Rheumatoid Arthritis respectively. They found that the wheal takes slightly longer to appear in Rheumatoid Arthritis. The figures they give do not show any marked difference between the healthy

and affected groups, and they suggest that there is need for many more determinations before definite conclusions can be drawn. In 10 patients in whom they measured the time taken for the appearance of the wheal before and after a course of treatment, they found a definite reduction in 5 cases.

They conclude therefore that in Rheumatoid Arthritis there is not only a lack of some dilator-substance normally present, but that there is also a delay in the response to this substance even when it is present or supplied.

The above rationalises the use of physical therapy in Rheumatoid Arthritis - something is supplied which is lacking (the H-substance) and the imperfectly-functioning tissues are trained to react to it.

Kovacs summarises thus the objects of physical therapy:-

Stimulation of the defensive mechanism of the body by improving circulation and metabolism through relief of increased capillary and arteriolar tone; activation of the digestive tract, and correction of faulty body mechanics.

The local effects aimed at in applying physical therapeutic measures are, relief of pain, prevention of stiffness or immobility in joints or the relief of these when they are present, and treatment of muscular weakness and atrophy.

The general effects aimed at are those enumerated by Kovacs.

The Physiotherapeutic measures used in the treatment of Rheumatoid Arthritis are:-

Application of Heat

Radiant Heat from incandescent Lamps ,
Infra-red radiations,
Baths,
Paraffin Wax,
Diathermy.

Baths

Immersion, with undercurrent douche,
Douche-massage,
Aerated Immersion,
vapour.

Electrical Treatments

Faradism and Galvanism, Ionisation.
Ultra-violet Irradiation.

Massage

Remedial Exercises

Manipulation

Splints, Plaster Casts, Extension by weights.

In discussing the effects of the various forms of physical treatment it is impossible always to keep them separate; thus, the application of heat may be by irradiation from incandescent lamps, by means of hot baths or by Diathermy.

HEAT.

The effect of heat applied to the skin is to increase local blood and lymph circulation, and thus promote resorption of pathological substances in the tissues. As a result of the dilatation and relaxation of the capillaries of the skin there is set up an increased reciprocal exchange of blood between the

superficial and the deeper blood-vessels with a consequent improvement in the circulation, and an increased metabolism.

The view held by Lewis that the effects of all Physiotherapy are due to the production in the skin of a Histamine-like substance has been referred to: a similar view is that the absorption, as a result of increased lymph-circulation, of "autogenous foreign proteins" following the application of heat (or any other form of physical therapy) brings about a protein-shock reaction.

General application of heat is by the radiant-heat bath, or by immersion or vapour baths.

For the treatment of Rheumatoid Arthritis, the general radiant-heat bath is not much used, as these dry-heat baths are far more exhausting than when the heat is applied through the medium of water. It is difficult to dissociate the heat effect of baths from their action as baths - discussion will therefore be postponed until baths are considered as such.

Locally, heat is applied for the relief of pain and as a preliminary to other physiotherapeutic measures. Relief of pain is brought about by a reduction in the sensitivity of the nerve endings. As a preliminary to massage - heat relaxes the skin and underlying muscles, and by stimulating the local circulation and lymph-flow acts as an adjuvant to the massage.

Locally, heat is applied by means of either incandescent electric lamps with reflectors, or by

means of irradiation with infra-red rays. The former produces rays which are visible to the eye but do not penetrate the skin; the latter are not visible but have a marked penetrative power and have thus a greater therapeutic value. Lamps producing infra-red radiations are available for use with electricity or gas, but infra-red rays of various wave-lengths (and thus of varying penetrative power) are produced by any hot substance, a glowing coal-fire or ordinary gas radiator, a heated flat-iron or even a hot-water bottle.

Treatment by "leucodescent" lamps or by infra-red irradiation should last at least 30 minutes.

The local application of heat by means of melted paraffin wax is of particular value where there is exudation into joints. I have applied wax in these cases on a large number of occasions with unfailing benefit. The exudation is lessened and pain is relieved, and the patient, no matter how unwilling he may have been to admit benefit from other forms of treatment, invariably states that the wax has done the joints good and "asks for more". Whatever the patient may think, and perhaps be allowed to think, there is no magical property in the wax. The benefit it produces is due entirely to the fact that by its means a higher temperature can be applied to the body without discomfort than by radiation or hot baths.

The wax is heated to about 130° ; the part to be treated can be immersed in a bath of this melted wax and allowed to soak in it for 20 to 30 minutes. A higher temperature can be borne without discomfort when the limb is kept perfectly still than when it is

moved about. A convenient, and equally efficacious, method allowing several patients to be treated at once, is to dip the part to be treated into the heated wax, withdraw it and allow the wax to set on the part, repeat the dipping and drying four or five times until a "glove" is formed on the limb. This is left on for about half-an-hour - maintaining the temperature of the underlying by virtue of its slow heat-conducting powers.

For application in the patient's home where smaller quantities of wax are available, it can be melted and painted on with a brush.

As has been said above, infra-red rays can penetrate the skin to some extent - this extent however is really only a very small one, and infra-red rays cannot penetrate as far even as the subcutaneous tissues. There is a means of applying heat to peri-articular tissues and even to the interior of joints - this is Diathermy - the "heating through" of the tissues by means of a high-frequency alternating electrical current.

Cumberbatch (57) finds that while diathermy cannot raise the temperature of such highly vascular organs as the kidney, spleen, liver etc., situated in the trunk, it can raise the temperature in the limbs, which are comparatively less well supplied with circulating blood (which tends to keep the temperature stable by convection) and have a much smaller cross-section. Edstrom (58) found by experiment that the interior of a joint can be heated by Diathermy.

Diathermy is of value in Rheumatoid Arthritis in aiding resorption in chronically thickened joints.

capsules, especially as a preliminary to manipulation or exercises.

Other methods of applying heat locally are by poultices, hot packs, the various patented kaolin pastes, peat, and the muds associated with various Spas. All of these owe their effects to their powers of maintaining a high temperature in the part they are applied to - if they have any action due to their chemical content this must be infinitely small, and in any case cannot be included as part of physical therapy.

All of the methods of applying heat locally, except Diathermy, are available for use in the patient's home; radiant-heat and infra-red lamps are sufficiently portable and cheap to be used by the general practitioner, as is also paraffin wax. The poultice or hot pack will probably have been applied to painful parts by some member of the patient's family before ever he has been seen by his doctor.

BATHS.

Glover, of the Ministry of Health, talking of the organisation of physical treatment said, "Hydrological treatment.....if not essential, is an invaluable adjunct for the resorption of inflammatory products, for the relief of pain, for rendering stiffened tissues supple, for the restoration of lost function in the joints and lost reaction in the skin, and for the re-education of wasted muscle".

There are two medical attitudes to balneo-therapy - that of the Spa practitioner who ascribes to

the baths and waters of his particular spa specific, almost miraculous powers, and that of the majority of general practitioners, a deep scepticism and almost contempt for the use of baths as treatment, as a form of medical quackery. As is often the case where widely divergent views are held, the truth lies somewhere midway between the two extremes.

We are not concerned in considering baths as part of Physiotherapy with the effects alleged to be brought about by absorption through the skin by the various chemical contents of different Spa bath-waters, except perhaps the CO_2 content.

The effects of bath-treatment are, firstly, those due to the temperature of the water which is the same as those of heat applied in any other way, except that heat applied to the whole body through the medium of water is less exhausting than dry heat, and secondly, those due to pressure effects of the water on the skin blood-circulation and pressure effects on the venous circulation brought about by increased intra-abdominal pressure. When the bath is aerated or contains natural gasses there is in addition a stimulating effect on the skin-circulation from the light massage-effect of the bubbles of air or gas.

Recently it has been claimed that CO_2 in water is absorbed through the skin, and produces the H-substance of Lewis by chemical irritation of the epithelial cells of the skin. Guilleaume and Wybauw say (59) that as a result of immersion of the skin in water containing CO_2 , there is a local increase in the calibre of the sub-papillary venous plexus and its

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blood is arterialised; also that this phenomenon is a local one with a sharp line of demarcation between the parts of the skin submerged in the bath and those not submerged. Vogt and Wachter (71) found that the vascular reactions brought about by the absorption of CO_2 vary with the temperature of the water - relaxation and dilatation being greater when the temperature of the water is raised.

The full immersion bath is the basis of all bath treatment. This is given "plain", or in the form of an aerated bath, air being pumped through the water, or in combination with douching and massage.

At Buxton the immersion bath is always combined with the under-current douche. The patient enters the bath with the water at a temperature of $96^{\circ} - 98^{\circ}\text{F}$; while he is sitting in the bath a strong jet of water (about 30 lbs to the square inch) at a temperature 10° higher than the bath water is directed on to his body through the water. The duration of the bath is usually from 10 to 15 minutes, but with emaciated patients who have perhaps been bed-ridden for months, the first baths are of shorter duration and gradually lengthened; in such patients the under-current douche is also given at a lower pressure.

If the patient is observed while in the bath, it is seen that the skin under the douche is momentarily blanched - the pressure of the water emptying the capillaries - then, when the douche-jet moves on to another part of the body, the blanched part becomes erythenatous as the capillaries relax and dilate.

After such a bath as the result of the general-

ised, superficial capillary dilatation, the blood-pressure falls and the pulse is slowed. A typical reading indicating the type of change which I have found repeatedly in patients with Rheumatoid Arthritis is:-

Full immersion bath at 96° for 10 minutes - douche at 105°F

Immediately before..... Pulse 97 per min.
Blood-pressure 142/86

Immediately after..... Pulse 90 per min.
Blood-pressure 126/80

In the Buxton Douche-Massage Bath, the immersion-douche bath is combined with massage. The bath is a shallow one about 15 inches deep - it is raised on legs to a height convenient for the masseur. The patient lies in the bath with his body just submerged, the water being at a temperature of about 98°F. Over the masseur's shoulder is hung the pipe delivering water at a temperature 10° higher than that of the bath and at a pressure of up to 30 lbs to the square inch. This he directs through a "rose" nozzle on to the patient's body, at the same time carrying out the prescribed massage which may be general or local. The pressure of the spray is adjustable to the condition of the patient - at the beginning of a course of treatment it is usually given at a pressure of about 14 lbs, and at the end of a course the patient enjoy the stimulus of a 30 lb spray. The douche massage bath takes about 20 minutes, and should be given only in the robust type of patient, or towards the end of a course of treatment to those of the less robust type

who have shown great improvement in their general condition.

A very valuable form of treatment which can be carried out in connection with the immersion-bath and under-current douche, or the massage-douche bath, is "skin-gymnastics" to train the skin to react to changes of temperature. This is carried out by finishing each bath with a "Scotch Douche" - a douche of gradually reduced temperature. Naturally, the "wind must be tempered to the shorn lamb", and this treatment carried out only when the patient and his skin shows signs of clinical improvement and then instituted gradually. At the end of the bath, the spray-douche is turned on to the patient at about 106°F and is then gradually reduced in temperature. At first it is as well for a few days to reduce it only to just below body heat, but generally it is soon possible to get down to a finishing temperature of about 80°F. The effect must be watched - after drying, the patient should feel stimulated and warm, if he feels chilled and shivery he is not in a fit condition to have this type of douche.

van Breemen (61) ascribes the "training value" of the cold douche to the fact that a cold-water stimulus causes hyperaemia of the skin in a different way to a hot-water stimulus. Heat hyperaemia is due to reflex stimulation of the dilator nerves to the arterioles, and is immediate; cold hyperaemia is due to direct action of the capillaries, which first contract, and then pass into dilatation.

The vapour bath is not much used in Rheumatoid Arthritis, except occasionally in the overweight type of patient with an associated hypo-glandular reduction in basal metabolism; it is always followed by the immersion bath. The temperature at which this bath is given is about 111°F -- 112°F and the duration about 10 minutes.

There can be no doubt of the value of bath treatment in the mind of any one who has seen the effects on a Rheumatoid patient of a course of treatment designed to suit the condition of the individual patient. The first improvement noted is in the condition of the skin; this becomes more elastic and looks healthier. Then, even without any other treatment being applied there is a general loosening of stiff joints (not, of course, of joints in which there is bony ankylosis) - the increased mobility may be slight, but it is definite and is associated with improvement in the muscle tone. This slight improvement often has a marked effect on the patient's mental condition, and encourages him in that co-operation in his treatment which is so essential if the best possible results are to be attained.

It is, of course, seldom that treatment consists of baths, or for that matter of any form of physical therapy, by itself, so that the effects of individual kinds of therapy are difficult to assess. The patients themselves often ascribe the improvement they feel in their general sense of well being, to the baths.

An important use of baths in treatment is in connection with assisted or spontaneous movements.

Limbs which have been rendered mobile by manipulation

or which it is desired to move after an acute attack, can be moved much more easily by either the patient or the masseur if they are immersed in a bath when their weight is supported by the water. A deep pool is desirable for this purpose, preferably one long enough to enable the patient to take several steps in it while holding on to a hand rail. This is particularly useful in commencing walking exercises after treatment of, or acute disease in, knees and hips, since, when the patient is submerged up to his neck most of his weight is supported by the water and the minimum falls on his knee and hip joints. These joints can in this way be put through their normal movements while bearing practically no weight, and the amount of weight borne by the joints can be gradually increased as the patient improves by lowering the level of the water in the bath.

Fortescue Fox (62) states that manipulation in a bath at cool temperature is stimulating, at sub-thermal temperature is sedative, and at hyper-thermal temperature is analgesic, and that heat, movement, and moisture, so combined, could produce effects which, as far as he knew, could not be obtained in any other way.

ELECTRICAL TREATMENT.

The electrical treatments most used in Rheumatoid Arthritis are Ionisation by means of the Galvanic current, and stimulation of muscles to contraction by the Faradic current, and Diathermy.

Ionisation, the introduction into the

tissues of drugs by means of the polar effect of the direct (Galvanic) current is not really part of physiotherapy - it is merely an electrical means of getting drugs into the patient. Whether Histamine is a "drug", and whether, if Lewis' view of the action of all physiotherapy being due to the production of a Histamine-like substance in the skin is correct, the passing of Histamine into the skin by means of the Galvanic current therefore becomes legitimately Physiotherapy, is a fine point.

Cumberbatch (63) is of opinion that the therapeutic effects of ionisation are at least partly due to the galvanic effects of the current on the tissues, that when the therapeutic ions are migrating into the body, the tissue ions are migrating as well.

Deutsch (54) considers the benefit of giving Histamine by ionisation to be due to :-

- (i) The effect on underlying muscle (vide ante re fourth element in "triple response of Lewis) is as good as that obtained by injecting Histamine into it;
- (ii) It is introduced evenly over the whole affected area;
- (iii) It is held in the poorly-vascularised upper skin layers, thus prolonging the effect.

J. Kovacs (64) has carried out a series of ionisations with a compound of Acetylcholine (Mecholin - acetyl-beta-methylcholine chloride) which is only slowly destroyed in the blood and tissues, and claims very good results in Rheumatoid Arthritis. He claims improvement in 90% of a series of 30 patients with less pain, stiffness and swelling, and more mobility

in the joints.

In comparing the action of Mecholin with Histamine, however, Kovacs makes the, to me, amazing statement that whereas Mecholin ionisation produces marked general effects, Histamine ionisation produces none. I have on several occasions seen marked general effects after Histamine ionisation - flushing of the face and neck, sweating, severe headache and lower blood pressure.

Locally after Histamine ionisation there is wheal formation on the skin under and of the same shape as the electrode. In joints which are not too far from the surface it is of value in aiding the absorption of fibrous thickening of the capsule - the joints in which it is of most value are the knees, shoulders, and tempero-mandibular joints.

Faradism, applied by means of the Smart-Bristow coil is extensively used to prepare wasted muscles for taking up their tasks when the joints they serve have been rendered mobile. Faradism acts through the muscles' nerve supply, and should not be used in place of exercise - it is a preparation, not a substitute, for exercise. It is used chiefly on the atrophied Quadriceps Femoris associated with an immobile knee joint, as a preliminary to, and after, mobilisation - before the "walking exercise" stage is reached.

ULTRA-VIOLET IRRADIATION.

The visible effect of irradiation of the skin by ultra-violet rays is erythema, appearing some hours after the irradiation has ceased. On Lewis'

hypothesis, this erythema is the result of H-substance produced as a result of the stimulus of the "insult" offered the skin by the rays.

The views of Llewellyn and Jones as to the part played by the ultra-violet rays in elaborating Tyrosine and Cystine, the amino-acids from which are built up the metabolism-stimulating hormones Adrenalin and Insulin, has already been referred to.

As a result of ultra-violet irradiation of the skin, Vitamin D is elaborated, and this, it is said (65) by doses too small to produce erythema.

Ultra-violet irradiation is prescribed in the debilitated type of patient - especially those hailing from large industrial towns. Sir Leonard Hill says that for general tonic treatment ultra-violet rays are best associated with visible and short infra-red rays. (66) In this hospital, such combined irradiation is used, and is obtained by using the Carbon-arc lamp as the source of radiation.

MASSAGE

Massage is used in Rheumatoid Arthritis for its general and its local effects.

The general effects of massage are in part due to the same process as occurs with other forms of Physiotherapy - production of H-substance. In addition there is improvement in the peripheral blood and lymph circulation, and with this the inoculation of the patient with "autogenous foreign proteins"

As has been stressed in earlier paragraphs, the stiffness or limitation of movements in joints in Rheumatoid Arthritis is for a long time due to fibrous changes in the capsules and in the joints themselves. If allowed to remain immobile, the joints eventually become fixed by bony ankylosis. It seems to me that insufficient advantage is taken of this fact in restoring mobility to joints in the stage where there immobility is due to fibrosis of the capsule and adhesions between the layers of pannus covering the articular cartilages.

It goes without saying that no attempt should ever be made to move a stiff joint forcibly, without first making certain by X-ray examination that there is no bony ankylosis, and that the pannus has not seriously eroded the cartilages. Given these conditions, it is my opinion that far too few patients with limited or absent movement in one or more of their joints are given the benefit of manipulative treatment. Blundell Bankart says (68) that manipulation "sometimes gives great improvement in Rheumatoid Arthritis especially of the shoulders", but that as a general rule not much benefit is derived, and the reaction which follows it may cause an even greater stiffness than before. This has definitely not been my experience in a considerable number of manipulations. The results of manipulative treatment depend on the after-treatment as much or perhaps even more than they do on the method of manipulation, and to a large extent on the experience of the manipulator in judging which cases are suitable

for treatment by this method. It is obviously useless, and unfair to both the method and to the patient, to attempt to straighten (as I have recently seen attempted) by manipulation and splinting, a hand which had had a very marked flexion fixation of the metacarpophalangeal joints for so many years that there were no longer any articular cartilages in the joints.

It is true that the best results of manipulation in Rheumatoid Arthritis are shown in the shoulder joints. In these, most of the limitation of movement is due to periarticular fibrosis - the cartilages are seldom affected. Douthwaite says (69) "Periarthritis of the shoulders should be manipulated - the loud cracks when adhesions go show that nothing else would have helped. Complete recovery is the rule". With this I am in complete agreement.

From the point of view of the patient, the most valuable results obtained by manipulation are in the knee-joints. Fixation of the knees in flexion either prevents walking altogether, or makes it a burdensome affair of sticks and crutches. Fixation in full extension - as the result of treatment by splinting - is only a slightly lesser degree of disability. From results obtained personally, and observed after manipulation by a colleague here, I have no hesitation in saying that a fair proportion of Rheumatoid knees can be made mobile and the patients enabled to walk.

Manipulations of joints are carried out under general anaesthesia. Though a considerable amount of force is sometimes used to break down fibrous adhesions

joints are never "forced" - the hands of the operator are soon educated to the feel of tissues "giving", and the manipulator must always bear in mind that often part at least of the limitation of movement is due to shortening of the muscles acting on the joint, and that these should be slowly stretched, not torn.

In manipulation of a knee it is important to remember to free the patella as a first manoeuvre, and that a tough pannus may be clinging as firmly to the menisci as these are to the bone, and that therefore these should be "guarded" by a strong grip of one hand while the other is producing the required movements of flexion and rotation of the tibia on the femur.

The elbow-joint does not, as a rule, give good results from manipulation, and if fixed in a good position functionally, is, on the whole, best left alone.

A fixed wrist-joint can sometimes be moved with surprising ease, and on occasion even without anaesthesia.

After manipulation, the after-treatment is of the greatest possible importance, the ultimate result depending entirely on it. There is usually a great deal of pain for some hours after a joint has been manipulated, and in almost every case Morphine is given within an hour of the patient's awakening from the anaesthetic, and the manipulated joint is put through the full available range of movement within 12 hours. After this, at least once every day, heat and massage are applied to the joint and neighbouring muscles, and passive movements are carried out, at first while the limb is submerged in the immersion bath. Between

treatments the limb is fixed in the optimum position by means of plaster fitted at the end of the manipulation, or by other forms of splinting. As soon as possible, active movements are commenced - at first while in the immersion bath, and later "dry". In the case of the knees, walking is commenced first in the bath, then in a walking chair, then with crutches and walking sticks, and finally, in many cases, unaided.

An objection often raised to manipulation is that it may "light up" the arthritis; the fibrous changes in the joints in Rheumatoid Arthritis are not due to the presence of pathogenic organisms in the joints, they are due to repair processes continuing after the, possibly bacterial, cause has ceased to operate. The reaction which may follow manipulation is not an organismal one, it is purely traumatic following the breaking down of the fibrous tissues which have been binding the joint, and is very amenable to the physiotherapeutic after-treatment.

MOVEMENTS AND REMEDIAL EXERCISES.

In the acute stage of Rheumatoid Arthritis the swollen joints may be extremely painful and the muscles acting on those joints are in a state of spastic contraction holding the joints immobile in that position which causes the least pain. This position, though the optimum one from the patient's point of view at the moment is invariably a bad one from the point of view of ultimate function. It is, therefore, the medical

attendant's duty to place the affected joints securely at rest for a few days in such a position as to relax the muscles, and thus prevent contractures.

The simplest means of doing this is by means of plaster of paris casings, and, as a rule, these or other splints are applied. The trouble is, however, that, in far too many cases, these immobilising splints are left on not for a few days, but for much longer. The dictum that "if the joints are to be fixed, let them be fixed in good position" is an excellent one; too often, however, the "if" is forgotten, and the limbs are treated from the beginning of the assumption that they are going to be fixed. This, in the majority of cases, is a needlessly pessimistic assumption.

In the acute stage of Rheumatoid Arthritis, the joints should certainly be put at rest, but only for three, or at the most, four days. After this they must be moved at least once in every 24 hours. It is not suggested that a full range of movement will be attained on the first or the few subsequent occasions, or that movements should be pushed past the stage which will cause severe pain, but with preliminary application of heat to the joints, a fair and increasing range of movement can be attained with the minimum of pain. At first, movement will be entirely passive, but should be made, at least partly, voluntary as early as possible to prevent excessive muscle wasting.

If affected joints are thus moved even only once a day, the fibrous pannus which will eventually form, is prevented from forming adhesions, and the peri-

articular fibrous tissue is prevented from contracting.

If there is one thing more than another in relation to Rheumatoid Arthritis that requires stressing to the medical profession it is this need for very early movements. Patients who have been allowed to lie in bed with knees drawn up for months on end, "treated" by weekly visits from their insurance practitioner bearing a week's supply of aspirin, are sufficiently common to constitute a reproach to the profession.

In the chronic stage of Rheumatoid Arthritis, movements associated with remedial exercises and appropriate splinting give results which compensate fully for the trouble involved.

The object of treatment is to help the patient through the stage of passive movements of stiff joints (which have been rendered more mobile by baths, heat, diathermy, manipulation, etc.) to the stage of assisted voluntary movements, and then to unassisted voluntary movements and exercises designed to suit the individual disease and patient. All joints and muscles benefit from such treatment, but it is perhaps seen at its best in treating typical Rheumatoid hands and Spondylitis Ankylopoetica.

Truly remarkable results can be attained by treatment carried out or directed by an efficient and properly trained masseur or masseuse working under the directions of a clinician with experience of rheumatic diseases. This hospital is fortunate in being organised as a school for trainees for the certificate of the Chartered Society of Massage and Medical Gymnastics,

and the word "exercise" takes on a new significance when one has the opportunity of observing, say, the measures designed and applied to restore or increase function in a deformed and wasted Rheumatoid hand. The wasted small muscles of the hand are given carefully graduated doses of exercise - first, by movements assisted by gravity, down an inclined plane, then on a level surface, and later against gravity up the inclined plane; squeezing exercises, commencing with balls of cotton wool and going on to air-filled, and later to solid, rubber balls of increasing hardness are designed to improve the grip.

In the summer, there are usually a sufficient number of cases of Spondylitis Ankylopoetica in the hospital to enable the formation of a "Spondylitis Class" in the gymnasium. The routine of the class is:-

Breathing exercises to increase the chest expansion;

Active movements to maintain the movement present in shoulders, hips, knees, etc.;

Muscle-training exercises for the longitudinal muscles of the back and neck, and the transverse and abdominal muscles, to overcome the tendency to postural sagging;

All classes conclude with 5 minutes light stimulating massage to the muscles of the back;

The whole class lasts about 30 minutes.

Exercises (and the use of a plaster case for the back, which will be referred to below) constitute the only predictably valuable treatment in Spondylitis Ankylopoetica. Except in so far as this treatment, with such other general physiotherapeutic measures as baths, massage, etc., raises the patient's resistance

and thus hastens its "dying down", there is no more a cure for this disease than for any other form of Rheumatoid Arthritis. Such treatment as indicated ensures that when the active stage has passed, as it very frequently does sooner or later, the patient, though he has a rigid back, has a straight one, and that his thorax can expand more than the $\frac{1}{2}$ to $\frac{3}{4}$ of an inch common in the untreated patient.

Patients with Spondylitis Ankylopoetica have generally to come to hospital for treatment for a period of six to nine weeks every year or two until the disease dies down to prevent loss of the improvement gained as the result of treatment.

Skilled training has great value in even so simple a matter as learning to walk with the aid of crutches or sticks; a patient who has perhaps not walked for a long time and is then enabled to do so as a result of treatment will reach the stage of independent mobility much sooner if he is trained to use his crutches or sticks by one who is himself trained in the mechanics of posture and walking.

Postural exercises are of great value in improving the general health in Rheumatoid Arthritis. Correction of the tendency to sag when standing - diminution of the lumbar lordosis and dorsal kyphosis, increasing the respiratory excursions of the thorax, and widening of the sub-costal angle, all help to stimulate metabolism and improve intestinal activity.

SPLINTS, EXTENSION APPARATUS ETC.

Plaster-of-Paris splints have wide application in the treatment of Rheumatoid Arthritis.

In the acute stage they can be applied to relieve pain by immobilising the affected joints for three or four days, and to prevent contractures of muscles, and such deformities as dropping of the wrist and ulnar deviation of the hand.

Later they can be used to correct these deformities or to prevent their recurrence after they have been corrected by exercises or manipulation.

For the treatment of Spondylitis Ankylopoetica, a plaster case, the Buxton Plaster-Bed, is made to fit the back of the patient's head and neck and his back as far down as the coccyx, while he lies prone; before this dries, the operator inserts his hands between the patient's neck and back and the plaster, and bends it to correct the existing exaggerated dorso-cervical curves. The plaster is dried, and if the patient is ambulatory, he lies in it for some hours every day, and sleeps in it all night - if bedridden, he lies in it all the time. For the first few days, the patient will probably find the plaster-bed uncomfortable and may even be sleepless for a night or two. Soon, however, he "sinks into" the case and his spine assumes the curves given to the case. After a time a new case is made, with slight further correction, and so on. Every patient thus treated for Spondylitis Ankylopoetica is given, on discharge from this hospital, a plaster-bed made a few days before, to take with him for use at home.

These plaster-beds give very good results in correcting abnormal curvatures of the spine in Spondylitis Ankylo-poetica. A record of the changes in the spinal curves under treatment is made by means of a flexible lead strip laid along the spine. A copy of such a record is appended, and illustrates the improvement under treatment and the retrogression after six months with further improvement when the treatment is repeated; this illustrates what was mentioned above - the necessity for repeated courses of treatment over a period of years to maintain the improvement gained.

In America the Bradford-frame bed is used for a similar purpose. It consists of a gas-pipe frame with strips of canvas laced across it. The piping is easily bent to any required curves, and these can be altered gradually as required.

Often, flexion deformities of the knees can be partly or wholly corrected by means of a MacIntyre splint, in which the two parts of the splint fit respectively above and below the knee posteriorly, and are joined by a hinge, the angle of which can be gradually increased by means of a screw thread.

Flexion deformities of the knees of longer standing can sometimes be corrected by means of a Balkan frame and weight-extension.

No attempt has been made in the foregoing to enter into technical details as to the different forms of massage, electrical treatments, dosage of infra-red or ultra-violet irradiations etc. It is not essential for the medical practitioner to know

this, what it is necessary for him to know is what the various forms of physiotherapy can do. The details of technique can safely be left in the hands of the technician, if he, or she, is properly trained and qualified.

In prescribing physiotherapy, every patient is a separate problem and must be assessed as such. Where one may be fit to be put on to treatment by massage-bath, in another this treatment would be too exhausting. One patient's stiff joints may be amenable to treatment by heat or diathermy, while those of another may only be made mobile by manipulation. In one, manipulation may be possible soon after admission, and in another only after the general health has been improved by weeks of treatment.

The progress of every patient must be watched carefully, and treatment increased or diminished or altered according to results and according to the patient's reaction to treatment.

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Incidence of Rheumatic Diseases in 600
consecutive admissions to the Royal
Devonshire Hospital, Buxton.
(300 Male, and 300 Female Patients)

Males



Females



Sub-acute
Rheumatism

Osteo-Arthritis

Rheumatoid
Arthritis

Fibrositis

Cases

120

80

40

Years

60

50

40

30

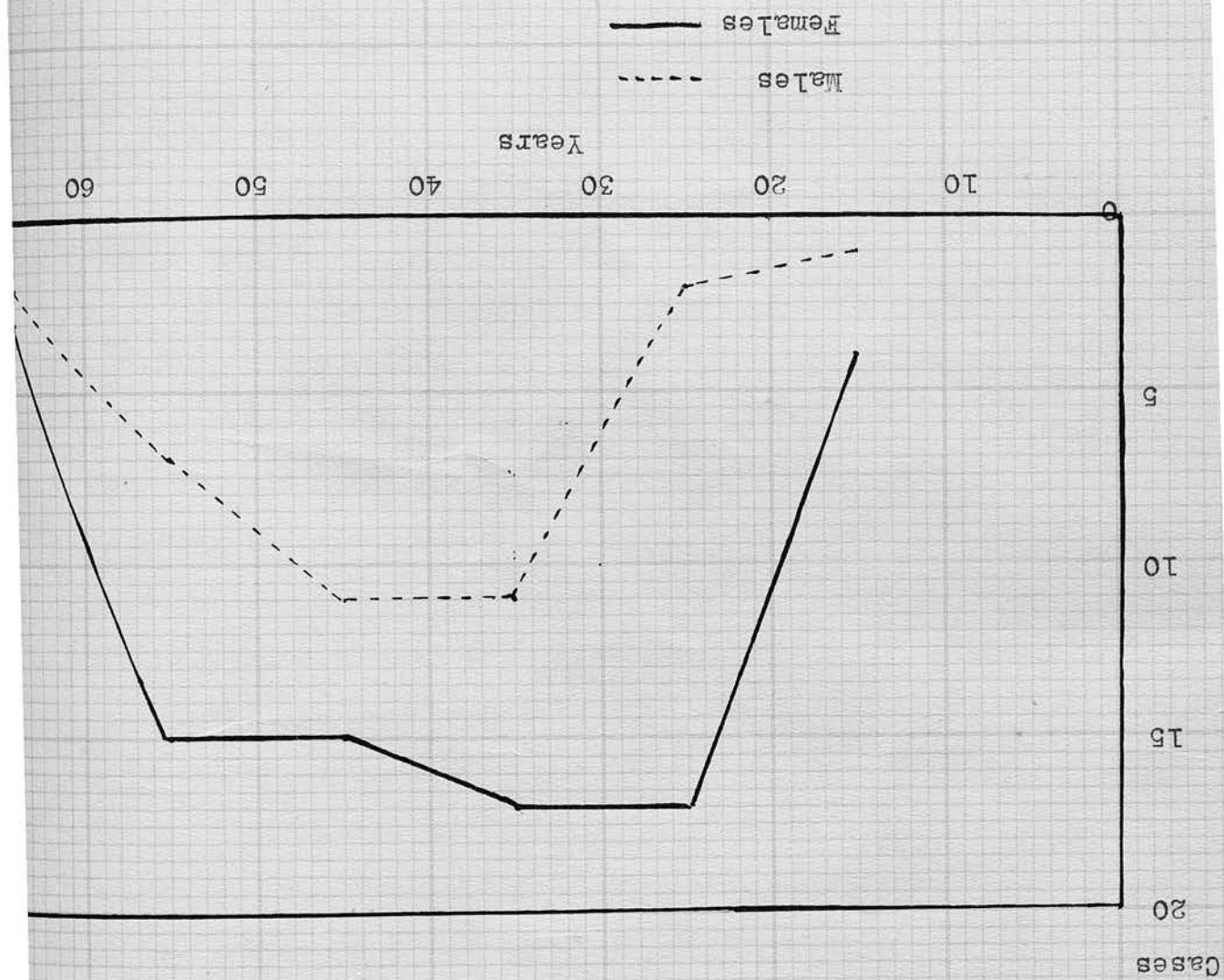
20

10

Females

Males

Age Incidence of 120 cases
of
Rheumatoid Arthritis



Grandparents and Parents... in 30 cases
Uncles and Aunts..... in 2 cases
Sisters and Brothers..... in 4 cases

i.e., in 36 cases or 30%.

PRECIPITATING CAUSES

The patient was first asked "Is there anything which you think might have brought on the Arthritis?". If the answer was "No", a direct question was asked, "Had you been subject to severe sore throats, or had you had an attack of Tonsillitis shortly before the initial attack?".

Tonsillitis or Frequent Sore-throat....	7
Influenza.....	5
Extraction of bad teeth.....	1
Mental Strain.....	8
Period of worry	4
Nursing ill relatives	2
Sudden mental shock	2
Working conditions (cold and damp).....	4
Followed Confinement.....	3

Only 6 gave definite histories of having had Rheumatic Fever, at times varying from $1\frac{1}{2}$ to 38 years before the onset of Rheumatoid Arthritis.

POSSIBLE INFECTIVE FOCI FOUND ON ADMISSION

By the rules of the hospital, patients seeking admission are supposed to have had obviously septic teeth and tonsils attended to.

In 15 patients there was definite constipation, 5 had definitely septic teeth, and 27 had either inflamed tonsils or tonsils from which pus could be expressed or had dark-red congested fauces. In 4 cases prostatic massage yielded secretion containing pathogenic organisms, the Gonococcus in one, and Staphylococci and Diphtheroid Bacilli in 3.

CLINICAL.

In 32 patients the hands were definitely cold and clammy;

In 15 patients the hands were moist, but not cold;

In 8 patients the hands were definitely warm.

The skin of the remainder appeared normal, as regards temperature and perspiration, to ordinary observation.

SUSPENSION STABILITY OF THE BLOOD.

The Suspension Stability of the blood was tested in 87 of the 120 patients - one-hour reading.

Between 30% and 40%.....	2
40% and 50%.....	27
50% and 60%.....	27
60% and 70%.....	20
70% and 80%.....	6
80% and 90%.....	3
90% and 100%.....	2

(A reading of over 90% in one hour is considered normal)

After treatment the improvement mentioned was found in the number of cases indicated:-

Between 5% and 10%	20
10% and 15%	8
over 15%	1

Of the 15 cases of Spondylitis Ankylopoetica, 3 were in the first group, 2 in the second, and 1 in the third, (an improvement in the S.S. of 21%).

The significance of the lowered S.S. is not absolutely certain - it is not an absolute indication of an active infective process - it is lowered in acute Gout, and in active neoplastic conditions.

It will be seen that only 29 cases out of 87 showed any marked improvement in the S.S., despite fairly constant clinical improvement.

WEIGHT.

34 patients had lost over a stone in weight since the onset of the disease;

18 "thought they were thinner";

12 were "well-covered";

The remainder were within the normal range of weight for their age and size.

DEGREE OF INVOLVEMENT.

The histories varied from the recent first attacks, to gradually spreading involvement at intervals over a period of as long as 30 years. The joint conditions, in accordance with this, varied from slight spindling of the fingers to bony ankylosis of almost every joint in the body. In some, involvement was, and had been from the onset, bilaterally symmetrical, in others there was asymmetry of involvement, and in others, the apparent symmetry had only supervened with the spread of the condition.

11 had marked limitation of movements of the shoulders;

21 had less marked limitation of movement of the shoulders;

26 had marked limitation of movement at the knees; (6 of these were chair cases, the remainder walking with crutches or sticks with various degrees of difficulty).

The remainder had various degrees and combinations of involvement of joints, ranging from stiffness and thickening, to complete immobility of fingers, wrists, elbows, knees, ankles, etc.

RESULTS OF TREATMENT.

Whereas it is fairly easy to say, in such a disease as Rheumatoid Arthritis, whether an individual patient looks, feels and is improved as a result of treatment, it is not easy to apply a measure to large groups. As has been said in an earlier paragraph, no patient with Rheumatoid Arthritis is labelled "cured" after treatment. Of the present 120 cases, 14 were marked on discharge I.S.Q. (in statu quo), 83 "Improved", and 23 "Much Improved".

The improvement consisted of increased mobility in joints, reduction in thickening and swelling of joints and of pain, improved muscle and skin tone, increase in weight and improvement in the patient's subjective feelings.

Many of the patients were housewives whose home life, with insufficient or incorrect food, overcrowding, over-work, and constant worry certainly played a part in originating or maintaining the disease, and it would be idle to deny that a 3 to 9 weeks release from home conditions plays some part in the improvement, especially in respect of gain in weight and improved mental outlook. But if mental and physical rest, and adequate diet have therapeutic value, then we must not use their good effects to decry the value of other forms of treatment, but we must include them in our therapy.

The results of therapy in the cases of shoulder and knee involvement mentioned above were:-
of the 11 with marked limitation of shoulder movements 7 were manipulated, and the other 4 not being considered

suitable for anaesthesia or manipulation, or refusing them. Of the 7, 5 were discharged with full movements at the shoulder, the other 2 patients proving "difficult" and not co-operating in the after-treatment.

Of the 21 with lesser degrees of limitation of movements at the shoulder, 18 showed various degrees of improvement with heat and massage, baths, diathermy or ionisation with Histamine.

The Knee cases: Of the 6 who were admitted as chair cases owing to fixation of the knees in flexion, only one was discharged as a "chair case". The other 5 were treated by weight extension or manipulation and were able on discharge to walk with crutches or sticks.

(It must be stated, however, that prior to admission every patient must submit a report from the home medical attendant, and patients who, it is considered, are not likely to benefit from treatment are not admitted).

Of the 20 others with marked limitation of movement at the knees, 4 were found to have bony ankylosis and gained only general improvement or improvement in the condition of other joints involved; the remaining 16 were treated by MacIntyre splints, weight extension, baths, infra-red irradiation, massage and manipulation, and all derived various degrees of increased mobility.

28.176 Male Age 77 Occupation - Farmer

History - Sudden onset of pain in both hands and wrists

in the fingers and wrists of both hands; pain after the shoulders became stiff and painful, and the left knee painful and swollen. The acute stage lasted 3 months, since then the pain in the joints has been constant but varying in severity.

Previous Illnesses - Gouty arthritis 11 years ago; rheumatoid arthritis 11 years ago

CASE HISTORIES

of the left hand 11 years ago

Attacked for fibrositis for 3 years, last attack 4 years ago.

Family History - 1 sister and 1 brother have rheumatoid arthritis

On Examination -

Shoulders - movement of right shoulder free, of left, greatly limited, especially abduction; hands - not cold or warm, grip weak; fingers - no swelling, tenderness to palpation; joints of index and middle fingers enlarged; flexion of fingers to normal; flexion of thumb to normal; wrists - bilateral swelling, motion limited; knees - bilateral swelling, motion limited.

Teeth Artificial (since Gastritis 11 years ago) -

Tonsils absent.

Radiologist's Report - Enlargement of bones around the metacarpophalangeal joints.

Treatment - Massage bath for 10 min. twice a day; irradiation with Röntgen to shoulders and knees; infra-red massage and exercises to shoulders and wrists; massage and exercises to hands, knees, shoulders and muscles of legs.

Result - Shoulders more freely moved; knees - flexion improved; hands - grip improved, motion in better condition, thickening of joints lessened.

Has gained 5 lbs in weight.

BK 178 Male Age 67 Occupation - Sawmiller

History - Sudden onset of pain, stiffness and swelling in the fingers and knuckles of both hands; soon after, the shoulders became stiff and painful, and the left knee painful and swollen. The acute stage lasted 3 months. Since then the pain in the joints has been constant but varying in severity.

Previous Illnesses - Gastritis 11 years ago; Shingles of the left side of the face 7 years ago; treated for Fibrositis for 3 years, last attack 4 years ago.

Family History - 1 sister and 1 brother have "Rheumatism"

On Examination -

Shoulders - movements of right shoulder stiff, of left, greatly limited, especially abduction;
Hands - not cold or clammy, grip weak, wasting of interossei, metacarpo-phalangeal joints of index and middle fingers thickened, ,
Flexion of fingers of both hands limited;
Knees - Left knee, flexion limited - crepitus.

Teeth Artificial (since Gastritis 11 years ago) -

Tonsils clean.

Radiologis's Report - Rarefaction of bones adjacent to metacarpo-phalangeal joints.

Treatment - Massage bath at 95° for 10 mins. douche 100°F
Ionisation with Histamine to shoulders and knees, infra-red, massage and exercises to hands, knees, shoulders and muscles of legs.

Result - Shoulders move freely, knees - flexion increased, hands - grip improved, muscles in better condition, thickening of joints lessened.

Has gained 4 lbs in weight.

BK 94 Female Age 21 Occupation- nil.

History - 3 years ago, gradual onset of pain and swelling in both feet, and later, in the hands; Over a period of $1\frac{1}{2}$ years the pain and swelling spread to knees and hips, wrists, elbows and shoulders, leaving them stiff. In hospital a year ago, where knees were fixed in plaster to ankylose them.

Previous Illnesses - Tonsillectomy 1 year after onset of illness.

Family History - Father has "Rheumatism"

On Examination -

Shoulders - right, moves freely; left, movements very limited, especially abduction;

Elbows - Right, only a few degrees of movement, left, flexion full, extension to only a few degrees past a right angle; pronation and supination, good;

Wrists - no dorsiflexion, limited palmar flexion;

Hands - marked wasting of muscles of left hand, less marked on right, fingers spindled, grip very weak on left, stronger on right.

Hips - movements limited, especially abduction;

Knees - both ankylosed in full extension, unable to sit down unaided;

Ankles - right, dorsiflexion limited.

Suffers from constipation, tongue furred.

Treatment- Immersion Bath 96° - 10 mins. - douche 106° F.

Passive movements to hips, and attempt to get slight mobility in knees.

Massage and exercises for muscles of legs and hands, and abdominal massage for constipation.

After 3 weeks, massage bath $96^{\circ}/10/106^{\circ}$

On discharge - considerable improvement in muscle condition, grip of hands stronger, spindling less marked, knees can move a few degrees, making walking a little easier.

S.S. improved from 55% on admission to 68%

No gain in weight.

CH 69 Male Age 28 Occupation - Despatch Clerk

History - Sustained a fracture of the right femur 2½ years ago; under treatment for about a year, in plaster, in bed in hospital. During this period, began to have pain, stiffness and swelling in the fingers, left knee and right ankle. When discharged from hospital, the right knee was practically rigid in extension, the left leg was "drawn up", and the right ankle stiff. 3 months later the right ankle was treated by tenotomy of the Tendo Achilles. Walked with crutches for over a year before admission here.

On examination - Robust build, walking with crutches, left heel about 4 inches off the ground;

Knees - right, full extension, only a few degrees of movement, periarticular thickening; left, extension incomplete by about 35, flexion from this position to a few degrees past right-angle with thigh;

Ankles - right moves freely, left, dorsiflexion very limited;

Hands - metacarpo-phalangeal joints of the right index and middle fingers thickened, inter-phalangeal joints of right index and middle, and of left ring fingers thickened.

Hands dry and warm, no marked wasting, no ulnar deviation.

Treatment - Vapour bath at 112°F for 12 minutes,

Immersion bath 96°F, 10 mins. douche 106°F.

Ionisation (Histamine) to knees, exercises to knees and ankle (left)

After 4 weeks - slight increase in movement in right knee, more flexion in left, extension the same as on admission.

MacIntyre splint to left knee, after 1 week, extension to left leg by weights, daily massage to leg; After 3 weeks, extension of left knee now to 12° from full; can now get left heel to the ground, but walks with a marked limp.

Macintyre splint, massage and Faradism to Quadriceps, walking exercises.

After 5 weeks, left knee manipulated under general anaesthetic. in plaster, full extension, for 4 days, then plaster bivalved, and daily movements and exercise, heat and massage to muscles of leg. Graduated walking exercises, first with walking chair, later with crutches, and sticks.

On discharge - 4 weeks after manipulation, walking well with one stick. Mental outlook much improved.

In hospital - 4 months.

BK 177 Male Age 49 Occupation - Brick Mechanician

History- Sudden onset 1 year ago of pain in the left foot and ankle, the ankle was swollen. Later there was pain and stiffness and swelling in the index finger of the right hand, and in the left shoulder.

On examination -Pain in the ankles, stiffness in the left shoulder, proximal inter-phalangeal joint of the right index finger swollen, left ankle thickened.
Foul smelling discharge from the nose (on culture - Tetragenous and Diphtheroids)
Prostatic Massage - no secretion, but centrifuged urine gave Diphtheroids and Staphylococci.

Treatment - Vapour Bath at 110°F for 10 minutes, immersion bath 96°F/10 min./douche 105°F. Ionisation to left shoulder and ankle with Histamine.
infra-red to shoulder, followed by massage and exercises.
After 2 weeks, vapour bath stopped,
Massage Douche at 96°F/15 min,/ douche 100°F.

On discharge - much improved, especially left shoulder.

H 122 Male Age 48 Occupation - Chauffeur.

History - Slight pain and swelling of the joints in the past year or so. 4 months ago, gradual onset of pain and swelling in the knuckles and wrists of both hands, and of the ankles. Recently the wrists have become stiff.

Previous Illnesses - Dysentery, Influenza and Malaria in 1916 - 1917;
Rheumatic Fever (?) 5 years ago (no signs of cardiac involvement);
Tonsillectomy - 10 days before admission here.

On examination -

Hands - not clammy, grip weak. (Has lost weight)
Marked muscle wasting and ulnar deviation. Radio-carpal, metacarpo-phalangeal and inter-phalangeal joint joints swollen;
Wrists - movements limited and painful, the right worse than the left.
No signs or symptoms in other joints.

Treatment - Massage-douche bath 96° F/10 min./ douche 100° F.
Paraffin-wax "gloves" to hands on alternate days.
Massage and exercises to hands and wrists;
Light palster splints to correct ulnar deviation of the hands;
Ionisation to wrists, with Histamine.

On discharge - Marked general improvement, ulnar deviation of hands much less (splints taken home to wear at night), swellings much reduced, wrists moving freely.

In hospital 3 weeks. S.S. 51% on admission, 50% on discharge.

BK 195 Male Age 34 Occupation - Clerk

History - onset - 4 years ago - gradual, slight pain in back of left wrist; after about a month pain in the left hip, and later in shoulders, and gradually "all over", over a period of 18 months. Joints were never swollen, but began to stiffen about a year from onset. The knees have gradually become drawn up.

On examination - very thin (has lost 1 stone in 4 years); narrow sub-costal angle and small antero-posterior diameter of chest.

Shoulders - move freely, with coarse creaking;

Elbows - extension slightly limited;

Wrists - only a few degrees of movement possible;

Hands - cold and clammy, slight wasting, no ulnar deviation, slight spindling of both middle fingers;

Knees - left, movements very limited, extension only to about 35 from full, flexion only to right angle; right, extension almost full, flexion to a few degrees past right-angle;

Feet - hallux valgus and pes planus.

Patients height, when standing, is 5 ft 2½ in.
(because of flexion of knees)

Treatment - for 1st 10 days, immersion bath at 96°F, for 10 minutes, douche, 106°F to 90°F.

Splints - "cock up" plaster splints for wrists, MacIntyre splints for knees;

After 10 days, on weight extension, with daily infra-red irradiation and massage to muscles of legs, and assisted movements to knees.

On discharge - much improved, knees almost straight, height, standing, now 5ft 4in.

(This patient's condition could almost certainly have been still further improved with further treatment, but he had to return home suddenly for domestic reasons, and was advised to return later).

In hospital - 3 weeks.

H 109 Male Age 28 Occupation - Coal Miner

History - 5 months ago had an attack of Influenza.

Shortly afterwards, there was sudden onset of pain in the back, and since then persistent pain and stiffness in the hips. There has been occasional pain and stiffness in the left ankle.

On examination - Back is rigid, attempted bending causes pain. Tenderness on pressure over vertebral spinous processes and over spinal muscles. No tenderness on pressure over the Sacro-iliac joints. Limbar curve flattened.

Radiologist's report - Decalcification of vertebral bodies, calcification of intervertebral joint capsules, ossification commencing at border of dorsal intervertebral discs, sacro-iliac joints show commencing loss of outline.

Diagnosis - early Spondylitis Ankylopoetica.

Treatment - Spondylitis Class (exercises to increase chest expansion, and improve posture - see page 79);
Aerated Baths at 93°F for 10 mins, douche 103°F.
General Ultra-violet Irradiation.
Plaster-bed for use at night only

Results - in this early case, only slight alterations in the spinal curves were present - mainly flattening of the lumbar lordotic curve, and no alteration in this resulted from treatment.

The general condition was much improved,

Weight on admission - 9st 4lb 5oz.

do. do. discharge - 9st 11lb 2oz.

i.e gained 6 lb 13 oz.

Chest expansion on 24th August $1\frac{1}{2}$ in.

do. do. on 16th Sept. $2\frac{1}{2}$ in.

do. do. on 30th Sept. 3 in.

SH 131 Female Age 58 Occupation, Maidservant

History- 1 year ago, was feeding poultry on a steep hillside when "I felt the ground slipping from under me. I was more shocked than hurt". Two weeks later, the joints of the hands became swollen and "cramped". Later there was pain and stiffness in the elbows, stiffness in the neck, and pain and swelling in the feet and knees.

Family History - Father has "Rheumatism"

On examination - is very thin.

Elbows - extension slightly limited;

Hands - not cold or clammy. Grip weak, wasting of interossei, and ulnar deviation. Metacarpophalangeal and interphalangeal joints thickened. Left hand cannot close.

Feet - Hallux valgum

Knees - periarticular thickening, flexion limited.

Treatment - Aerated Bath at 94° for 10 mins. Douche 106°F. After 2 weeks changed to Douche-massage bath at 98° for 15 mins. Douche 100° - 80°F. Plaster splints for hands; Massage and exercises to muscles of hands, arms, legs. General Ultra-violet irradiation twice a week.

On discharge - Feels much better, grip stronger, walking well. Ulnar deviation of hands less marked.

BK 164 Male Age 58 Occupation - Indoor Postman

History - 1 year ago, sudden onset of pain and swelling
in feet, later in hands and wrists, elbows,
shoulders and knees. There was also pain in
the right side of the face and back of neck.

On Examination -

Wrists - movements very limited;

Hands - fingers spindled - middle and index
fingers of both hands, only;

Knees - Move freely, with crepitus;

Feet - metatarsalgia

Previous Illnesses -

Carbuncle 6 years ago,

Irido-cyclitis 13 years ago

Treatment -

Vapour bath at 110°F for 10 minutes

Immersion Bath at 98°/10min./douche 104°F

Diathermy to wrists and massage to muscles
of forearm and attempted passive movements
to wrists.

10 days later after X-ray examination
(decalcification of bones, joint-spaces
slightly narrowed, cartillages good) wrists
manipulated under general anaesthesia.
After-treatment, infra-red, massage and
movements to wrist and forearm.

On Discharge - Full movement at wrists,
feels "champion"

H 157 Female Age 44 Occupation - Weaver

History - Slight twinges of pain in the joints for 5 years. 2 years ago, sudden onset of pain and swelling in the right knee and ankle. Swelling gradually subsided, but pain has persisted; later there was pain in the fingers of both hands intermittently, and mostly at night - never swelled. 2 months ago there was severe pain in the left knee. Has been unable to work for the past 6 months.

Previous illnesses -

Appendicectomy 6 or 7 years ago
Laryngitis 3 or 4 years ago

On Examination - Has lost about 1 stone in weight in the past year. Right tonsil enlarged. Small nodular swelling in the isthmus of the thyroid gland and soft diffuse enlargement of the right lobe.
Menopause about 1 year ago.

Knees - Bend freely with fine crepitus.
Right knee held slightly flexed in walking, walks with one stick.

Treatment -

12/11/35 Aerated immersion bath
95°/10 mins./Douche 104°F.
22/11/35 Knees swollen. Paraffin wax packs to knees;
29/11/35 No better; Plaster case applied from ankles to two-thirds of the way up the thighs, for 4 days. On removal, swelling has subsided. Passive movements in bath;
5/12/35 Active movements commenced;
12/12/35 Swelling in knees gone;
Massage bath 96°/15 min./Douche 104°F.
Massage to Quadriceps, and muscles of calves; walking exercise;
20/12/35 "Flare up" in left knee - painful and swollen. Right knee having full movements in bath and in Massage Department.
Left knee moved in bath only, and not through full range;
10/ 1/36 Left knee - swelling and pain gone, now moving from full extension to past a right-angle of flexion;
Both legs - infra-red, massage and exercises; walking exercises.

24/ 1/36 Ionisation with Histamine to knees;
31/ 1/36 Walking without sticks,

On discharge - much improved.

S.S. 30/11/35 89% 23/12/35 67% 31/1/36 86%.

H 171 Male Age 38 Occupation - Sheet-metal-Worker

History - Onset 18 years ago, during the War, ascribed to exposure. Gradual onset of pain and stiffness starting in the lumbar region. Invalided from Army in 1917 - Condition bad for 6 months then got better. Later, intermittent attacks of pain radiating to the front of the body, and sometimes in shoulders, arms, neck and hips. The condition was acute in December 1928 and in February 1929. The lumbar curve was then flattened. In 1931 was in this hospital with pain and stiffness in neck and shoulders; the spine was rigid from the 4th cervical vertebra downwards. In 1932 there was marked kyphosis in the dorso-cervical spine. In February 1935 complained chiefly of pain in hips, thighs, and knees; remained in hospital until 2/4/35. Readmitted here 22/10/35. Feels better than when last admitted. Condition of spine - see tracing appended

Weight -

19/2/35	9	stone	11	lbs	2	oz
2/4/35	10	"	7	"	0	"
22/10/35	9	"	12	"	15	"
3/12/35	10	"	4	"	4	"

Chest Expansion -

20/2/35	1½ in.
1/4/35	1½ in.
23/10/35	1¾ in.
27/11/35	2½ in.

Treatment -

Immersion bath 98°/10 min./105°F.
General ultra-violet radiation,
Spondylitis class,
Plaster bed day and night except for periods of other treatments.

H 182 Male Age 47 Occupation - Bricklayer

History - Onset 4 or 5 years ago with gradual onset of pain and stiffness in back, neck, shoulders and hips. Gradual limitation of chest expansion and, bending of back. Was able to continue at work for 3 years. In bed from Aug. to Dec. 1934. Treated here 23/4/35 to 25/6/35.

On Examination - (5 months after discharge from previous period of treatment)

General condition much improved in comparison with condition on previous admission - back straighter, breathing better.

Since discharge has had to rest for 2 hours every afternoon; complains of pain in hips and down the front of the thighs; neck has become bent forward.

Neck - held with chin almost touching chest; nodding movement very slight, rotation to right about 30° , to left about 15° .

Shoulders - Abduction, to horizontal only;

Back - Mid-dorsal kyphosis, lower dorsal and lumbar region flattened; whole spine rigid.

Sterno-clavicular joints thickened; respiratory movements very small, ($\frac{3}{4}$ in.)

Treatment -

Aerated immersion bath $95^{\circ}/10$ min./douche 104°F .

General ultra-violet irradiation;

Spondylitis class;

Plaster Case.

On Discharge -

Spinal curves much improved,

Chest expansion $1\frac{1}{4}$ in.

BK 87 Female Age 20 Occupation - Office worker

History - In Aug. 1934 had pain in the second toe of the right foot; about a month later there was transitory pain in the right foot, lasting a day or two. Then there was aching pain not definitely localised to the joints, in the left foot. In the next 3 or 4 months, there was "flitting" pain in almost every joint, and pain in the muscles of the front of the thigh. Early in 1935 the fingers began to swell, and became painful and stiff, then the wrists, knees, elbows, hips and shoulders in that order. Has been confined to bed since January 1935.

Before the onset had been subject to chilblains, the hands had not been sweaty. There was gradual loss of energy for some months before the onset. The Thyroid gland had been enlarged for some years before, but "had never worried" the patient.

No tonsillitis or bad teeth, no constipation. Menstrual periods quite regular until the acute stage of the disease, then stopped for 6 months and appeared again in Aug. 1935.

On Examination -

Tall, thin (has lost over 2 stone in weight)
Narrow sub-costal angle. Complexion good, skin, especially of hands, sweats profusely.

Shoulders - All movements very limited.

Elbows - Fixed at about a right angle, all movements, only a few degrees.

Wrists - Fixed in palmar flexion, practically no movement, long flexors shortened, muscles of forearm grossly wasted.

Hands - Typical Rheumatoid deformity, no movement at carpo-metacarpal joints. Marked wasting of small muscles, ulnar deviation,

Metacarpo-phalangeal joints thickened, and flexed, some movement present; fingers spindled, and proximal interphalangeal joints hyper-extended, distal interphalangeal joints flexed.

Hips - All movements greatly limited.

Knees - Only a few degrees of flexion possible from full extension.

Ankles - Movements greatly limited.

Feet - Metatarso phalangeal joints fixed in dorsi flexion, with plantar-flexion of proximal interphalangeal joints.

This patient has proved very resistant to all forms of treatment . She has had stock and autogenous Streptococcal vaccines, gold, protein shock, etc.

In the past 5 months she has had only physiotherapy, immersion baths, infra-red radiation followed by massage and exercises to muscles and joints. Weight extension has been applied to the hips and splints to the hands. At present she is still bed-ridden but shows very slight increased mobility in all her joints. She says she feels much better "in herself", since she started the immersion baths, and the volume and tone of her muscles and the tone of her skin have visibly improved in the last 3 months.

CH 113 Female Age 35 Housewife

History - Gradual onset of pain in the fingers, a few months after the birth of a child. Condition was steadily progressive for 4 years when she was admitted to this hospital (March 1931) with " fingers spindled and flexed, wrists and elbows partly fixed - knees and ankles swollen and crepitant" A diffuse enlargement of the Thyroid gland was then noted. Treatment then was by an autogenous vaccine prepared from the Streptococcus Viridans obtained from the tonsils. She was again treated here in 1932 and 1933, on each occasion with temporary improvement. When seen by me in October 1935, she had been sent here from a London hospital where she had had X-ray therapy; her condition then was:-

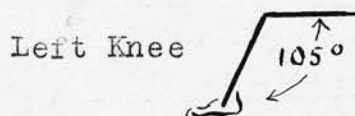
Complains of pain in the left shoulder and both knees;

Hands - fingers spindled and flexed, metacarpo-phalangeal joints swollen, grip very weak, interossei wasted;

Wrists - movements very limited and painful;

Elbows - movements limited;

Knees - marked thickening, movements only a few degrees from the position of flexion in which they are held



Is unable to walk, uses a wheel-chair.

Radiologists Report - on Knees.

Fair joint-space, cartilages thinned, but not irregular.

Treatment -

16/10/35 Put on weight extension (Balkan frame) with once-daily infra-red and massage to legs;

4/11/35 Left Knee now at 156°

Right Knee at 140°

(During this period, when assisted, and later

voluntary movements became possible once daily, Faradism to the Quadriceps was added. Legs much straighter. Off extension. Walking exercises started, at first in walking-chair and later with crutches. Immersion baths at 96°/10 min./104°F douche, with movements of the legs in the bath.

The general condition gradually improved, but as the condition of the hands made the use of crutches difficult and undesirable, and did not promise improvement from treatment, it was decided to attempt to straighten the legs completely by manipulation.

9/12/35 Knees manipulated under general anaesthesia, full movements obtained. MacIntyre splint applied with knees in full extension. Daily movements, first, in bath, later "dry". Infra-red, massage and Faradism to Quadriceps.

20/12/35 Walking with crutches, standing much straighter;

17/ 1/36 Walking greatly improved

24/ 1/36 Walking with 2 sticks.

Discharged and advised to return in 4 - 6 months for further general treatment.

BK 118 Male Age 22 Electrician's Apprentice.

History - Onset 7 years ago. Sustained an injury to the left hip and across the shoulder blades through a fall - was off work 3 days. Three months later, the left leg became weak; the weakness was progressive, and in about a month there was pain in the left groin, worse in the morning and working off during the day. For the next few months, was able to work and to use a cycle, but always had pain and weakness in the left leg and groin. This got worse, and in August 1929 he had to have 3 weeks off work; this lack of exercise seemed to make the condition worse, and in Decr. 1929 the left knee became painful. Jan. to Aug. 1931 he was in hospital, the condition got gradually worse and he was put on abductor splints for 4 months. He went home and was in bed until Jan. 1931, both knees and hips being stiff. He began to get massage and movements at home, and the knees and the hips became slightly mobile, and he could get about on crutches and sit in an easy chair. In May 1932 the condition became worse again, the joints being painful and swollen. This time the right wrist and later the left was swollen, and later the shoulders, jaws, and neck stiffened, and the ankles swelled.

Has been in bed at home since Sept. 1932 with only occasional massage from his mother, getting gradually stiffer in every joint, and being

told by the various medical advisors he has had that nothing could be done for him and that it was useless him going anywhere for treatment.

Previous Illnesses -

Scarlet Fever in 1918, and again in 1934. In 1932 he had pain in the back and passed blood-stained urine for 4 months.

On Examination -

Jaws - Stiff, Can separate the teeth only about one-eighth of an inch;
Neck - Stiff, movements limited;
Shoulders - Movements mainly scapular;
Elbows - fixed at a right-angle (right elbow)
Left - movement from right angle to almost full flexion;
Wrists - right, fixed in slight flexion, left, fixed at right angled flexion.
Hands - Very moist and clammy.
right - metacarpo-phalangeal joints fixed in flexion, terminal joint of little finger flexed.
Left - finger joints moveable.
Interosseal wasting marked, no ulnar deviation.
Hips, Knees and ankles fixed - slight abduction possible in left hip, enabling separation of knees by a $\frac{1}{2}$ inch. The right leg is adducted.
Feet - Rotated outwards through 90° .

Before treatment was instituted this patient was seen in consultation with the Visiting Orthopaedic Surgeon to the hospital. Hopeless as the position appeared, after 3 years of neglect, it was decided in view of the patient's youth to attempt to obtain mobility of his joints by physiotherapeutic measures for some months before deciding to attempt to mobilise such joints as would offer prospects of his being able to walk, by surgical means. He has now been under treatment for 21 weeks and though there has been great improvement in his general condition, and some improvement in the mobility of his joints, it seems that surgical mobilisation of his hips offers his only chance of being able to walk.

Treatment -

Immersion bath at $96^{\circ}/10$ min./ 105° F.

Plaster-of-Paris splints to hands,
Ionisation (Histamine) to jaws and knees.
Infra-red, massage, and passive movements in
the bath, and later in bed, to muscles and
joints.

Condition after 21 weeks of treatment.

Feels "tons better", Skin looks healthy.
Jaws - admit $\frac{3}{8}$ inch wedge between the teeth;
Neck - movement improved, especially nodding.
Shoulders - left, mobility much increased;
Elbows - left, extension increased about 40°
Wrists - left wrist has been gradually straight-
ened, by a series of plaster splints, exercises
etc. so that it is now able to move voluntarily
through about 35° . Movement in the right
wrist is also much increased.
Hands - not cold or clammy.
Right hand - in statu quo
Left hand - grip much improved;
Hips - Knees can now be separated 6 inches;
Knees - Left knee can bend about 10° ;
Feet - Slight improvement, some mobility in
left ankle.

The patient's mental outlook is now completely changed,
he is now cheerful and hopeful - he feels himself that
the treatment he has been having in the past few months
would, if applied, 3 years ago, have prevented his joints
from becoming fixed, and it is difficult not to agree
with him.

P 194 Female Age 47 Housewife

History - For about 1 year had been feeling "below par", General weakness, loss of appetite, etc. About 9 months ago, gradual onset of pain and swelling in the right ring finger. Soon after the hands, elbows, knees and ankles, and shoulders were affected in approximately that order. In bed 18 weeks. Since then the pain, stiffness and swelling vary in intensity from time to time; on the whole the condition is becoming gradually worse. Has not lost much weight. No previous illnesses.

Family History -

Mother crippled with Rheumatoid Arthritis.

On Examination -

Shoulders - movements good, crepitus in right
Elbows - move freely and fully ;
Wrists - diffuse puffy swelling, movements full but painful;
Hands - Cold and clammy, slight wasting of muscles, no ulnar deviation.
Metacarpal-Phalangeal joints - right index and middle, and left middle, swollen;
Proximal inter-phalangeal joints - right index, middle and ring, and left middle, swollen;
Knees - movements full and free, crepitus in left;
Ankles - Puffy swelling, movements full;
Feet - Cold and clammy, Pes Planus.

Treatment -

Vapour bath at 110° for 10 minutes followed by immersion bath - 98°/10 min./douche 105°F. after 2 weeks, douche-massage bath, 98°/10 min./douche 100° to 80°F. Paraffin wax to hands, wrists and ankles.

On Discharge -

Feels much better, swelling at ankles and wrists and fingers much reduced.

P 159 Age 52 (unmarried) Housemaid

History - Onset 2 years ago (menopause 8 years ago)

Gradual onset of aching pain in the feet; improved with medical treatment. 9 months later (Christmas 1934) "caught a cold" and there was sudden onset of pain and swelling in the left knee. In bed 5 months during which the knuckles, shoulders, and the other knee were similarly affected. Since May 1935, the condition has gradually improved, there have been no acute pain or swellings, but the left knee has remained bent. No previous illnesses.

Family History -

Mother has Rheumatoid Arthritis.

On Examination -

Not very thin. Walks with a stick and a marked limp due to flexion of the left knee.

Elbows - flexion greatly, extension slightly, limited;

Wrists - right - movements limited, left - movements full;

Hands - dry and warm; small muscles wasted. slight ulnar deviation.

Metacarpo-phalangeal joints of index and middle fingers thickened, markedly on the right, slightly on the left;

Knees - right knee flexion full, extension slightly limited, left knee flexion full, extension about 30° short of full;

Treatment -

Immersion bath, 96°/10 min./douche 104° F. Movements and exercises to elbows and right wrist after paraffin-wax bath,

Exercises to hands after paraffin-wax bath, ionisation with Histamine to knees followed by exercises,

MacIntyre splints to knees, and light plaster splints to hands to correct tendency to ulnar deviation, to be worn at night.

on Discharge - Increased movements in elbows and wrists, grip improved, less wasting and ulnar deviation, knees practically straight and walks with only a slight limp.

Fresh plaster splints for hands given on discharge, for wear at night at home.

In hospital - 6 weeks.

P 189 Age 43 Occupation - Labourer.

History - 3 years ago there was gradual onset of pain and swelling in the hands, and pain and stiffness in the shoulders. The pain gradually subsided, but the swelling of the hands and the stiffness of the shoulders did not quite disappear. He was fairly well for about 2 years. 3 months ago there was a sudden exacerbation of the swelling in the hands, which became very painful, and in a few days the shoulders, neck, and ankles were similarly affected. The condition has improved in the past 2 weeks.

Previous illnesses - none.

Family History - Clear of Rheumatic disease.

On Examination - Complains of pain in hands, shoulders and neck;
Shoulders - painful on attempted movement, all movement limited especially abduction;
Wrists - movements slightly limited - swollen and painful;
Hands - fingers spindled, interossei wasted, ulnar deviation of the fingers at the metacarpophalangeal joints, which are swollen, grip fair;
Ankles - swollen and painful, some limitation of movement.

Has lost 2 stone in weight in the past 3 years, perspires a great deal, not constipated, throat clean.

S.S. 60%.

Treatment - Vapour bath at 110° for 10 minutes followed by immersion bath 98°/10 min./douche 105°F. Paraffin-wax to hands, wrists and ankles; ionisation to shoulder with Histamine, Massage to muscles of shoulder girdle and hands, and exercises to shoulders and hands. After 2 weeks vapour bath omitted and douche-massage bath given, 98°/10 min./douche 100° - 80°F

On Discharge - Much improved, swellings much reduced - shoulder movements limited but painless - to return in 3 months for manipulation of shoulders when acute stage has quite passed.

P 192 Female Age 38 Housewife.

History - 4 years ago gradual onset of pain, stiffness and swelling in the right hand; later the right knee, elbow and shoulder, and still later the right ankle and left shoulder were similarly affected. ($1\frac{1}{2}$ years ago). Recently the left elbow has been swollen, painful and stiff.

Previous Illnesses - Operation for "cyst in the stomach" 4 years ago.

On Examination -

Shoulders - movements very limited - crepitus;

Elbows - marked limitation of flexion and extension;

Wrists - movements of right wrist limited;

Hands - metacarpo-phalangeal joints of the right thumb and index finger thickened;

Knees - move freely, some crepitus.

Throat slightly congested.

Treatment -

Immersion bath 96°/10 min./douche 106°F.

After 10 days, patient putting on weight, douche-massage bath 98°/15 min./douche 100°F.

Infra-red radiation and massage to arms and shoulders followed by exercises to elbows, shoulders and right wrist.

After a week, shoulders manipulated under general anaesthesia (right wrist also moved).

After-treatment infra-red and massage, passive, later, active movements and exercises.

On Discharge - Slight increase in movements at the elbows. Movements at shoulders and right wrist, now full.

Feels much better, has put on 7 lbs in weight.

In hospital 3 weeks.